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THE
AMERICAN
JOURNAL OF PHARMACY

PUBLISHED BY AUTHORITY OF THE

PHILADELPHIA COLLEGE OF PHARMACY

EDITED BY

HENRY KRAEMER

PUBLICATION COMMITTEE FOR 1912

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VOLUME 84

PHILADELPHIA
1912

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DR WALTER WYMAN, 1848-1911.

THE AMERICAN
JOURNAL OF PHARMACY

JANUARY, 1912

WALTER WYMAN.

Dr. Walter Wyman, Surgeon-General of the United States Public Health and Marine-Hospital Service, a member of numerous scientific and professional organizations and an Honorary Member of the Philadelphia College of Pharmacy, died in the City of Washington, November 21st, 1911. He was born in St. Louis, Mo., Aug. 17, 1848, his father, Edward Wyman, LL.D., being a widely known educator of that city.

Walter Wyman received his academic education at the University of St. Louis and later attended Amherst (Mass.) College, from which he received the degree A.B. in 1870, A.M. in 1889 and LL.D. in 1911. His medical course was taken in St. Louis, where he graduated in 1873 from the Medical Department of Washington University, then popularly known as the St. Louis Medical College. Dr. Wyman entered the Marine-Hospital Service as Assistant Surgeon Oct. 21, 1876, was promoted to Surgeon Oct. 1, 1877, and was made supervising Surgeon-General May 27, 1891. Practically all of the working years of his life were devoted to the development of the public health service and to bringing about a proper recognition of the value of sanitation and preventive medicine.

During the 20 years of his administration as the executive head of the Bureau the service was expanded, from its somewhat restricted field of caring for sick and disabled seamen and a general supervision of medical matters in connection with the merchant marine, to the representative public health service of the United States with a wide range of work already established and the possibility of additional achievements limited only by inadequate appropriations and the hampering influences of men who should be, and in many instances claimed to be, favorable to the development of public health work.

While the evolution of the Public Health Service, in this country, has at times been characterized as being extremely slow, an unbiased retrospect of the development of the Public Health and Marine-Hospital Service during the administration of Surgeon-General Wyman will convince the most skeptical that as far as he was concerned there can be no question but that his contribution to the safeguarding of the public health has been of a constructive and permanent character. While naturally conservative he was consistent in being sure of the ground which he traversed and it has truly been said of him that the enforcement of the laws and the regulations entrusted to his Bureau has been uniformly firm, impartial and thorough. Furthermore, the legislation which he advocated and secured was practical and complete and has withstood the test of time.

The Act of 1902 under the provisions of which the U. S. Public Health and Marine-Hospital Service is at present organized not only changed the name of the Service but also served to broaden the scope and increase the efficiency of its work by making statutory provisions for a number of the activities which previous to the enactment of this law, had only the authority of regulation.

In addition to the Marine-Hospital Service and the supervision of the Quarantine Service throughout the United States and its dependencies, this Service now provides for the systematic study of endemic and epidemic diseases and the development of methods for controlling the same, and its organization is based on such fundamentally broad lines that it can, and no doubt will be developed into a public health service second to that of no other nation.

Even as at present organized, and hampered as it is by a lack of due appreciation on the part of the people who should be deeply interested, this Service has been able to accomplish much toward securing to the citizens of this country additional safeguards against infectious diseases and greater uniformity in the potency and efficiency of some of the more important remedies used by physicians.

Not the least valuable of the practical accomplishments of this Service during the administration of Surgeon-General Wyman is the recognition that has been accorded to pharmacy as a factor in the public health work. This is evidenced more particularly by the standardization of serums and vaccines, and the study of other medicaments used in the treatment of diseases, that have been carried on in the Hygienic Laboratory of the U. S. Public Health and Marine-Hospital Service.

This laboratory was the creation of Surgeon-General Wyman, who devoted considerable time and thought to its development along highly scientific though strictly conservative lines. The several divisions of the laboratory are primarily devoted to the study of diseases and the remedies designed for their modification or cure, and even in the short time that it has been in existence it has amply demonstrated the possibilities of conscientious research work and the importance of systematically controlling the more potent agents used in the prevention and cure of diseases.

It was in this laboratory that pharmacy, advanced, scientific and utilitarian pharmacy, first received proper recognition in Government Service, and as noted above, much of the work that has been done in the several divisions of the Hygienic Laboratory is more or less directly interesting to the really up-to-date pharmacist. The truth of this assertion is amply evidenced by the 78 Bulletins that have been issued up to the present time more than half of which deal with subjects of direct interest to pharmacy.

Surgeon-General Wyman was an efficient administrator, alert, progressive and so thoroughly devoted to his duty that despite his naturally retiring personality he was able to enthuse all who came in contact with him and the resulting zeal of the medical officers of the service has contributed no little to the effectiveness of the work done under the auspices of the Bureau.

As an illustration of the varied character of activities of the Public Health and Marine-Hospital Service it is but necessary to point out that it has been instrumental, during the administration of Surgeon-General Wyman, in restricting yellow fever in the Southern States, stamping out bubonic plague in California, preventing an outbreak of pestilence in San Francisco, investigating hook worm disease and pellagra in the Southern States, making a systematic study of leprosy, a comprehensive study of typhoid fever, a study of the general problem of rabies and in resisting threatened cholera epidemics in addition to the almost innumerable routine and special activities of different branches of the service.

The life of Dr. Wyman was indeed heroic for, while he possessed ample opportunity for basking in the blaze of publicity and despite repeated recognition of his ability as an expert in sanitation, he chose to direct the multitudinous affairs of the Bureau over which he presided in such a way that his name but seldom appeared prominently in connection with the work done by his subordinates. Those who knew him best admired his genius for organization and his ability to cope with momentous questions relating to public health and sanitation.

His death is a loss not only to his friends and to the members of the medical and pharmaceutical professions, but also to the Nation. M. I. W.

THE DETECTION OF GUM AMMONIACUM AND GUM GALBANUM IN ASAFETIDA.

By H. M. Sechler and M. Becker,
Analytical Department, Smith, Kline & French Co.

Owing to the very high price of Asafetida and consequently the temptation to adulterate it with gums of lower price, it seems that more specific tests should be inserted in the next pharmacopœia for the detection of other gums, particularly Gum Ammoniacum and Gum Galbanum. Professor Charles H. LaWall first called to our attention that Gum Ammoniacum and Gum Galbanum were possibly being used to adulterate Asafetida.

Color Reactions to Detect the Presence of Gum Ammoniacum and Gum Galbanum in Mixture with Asafetida.—For the purposes of applying the various color tests ten per cent. emulsions were prepared from Asafetida, Ammoniacum and Galbanum, also a ten per cent. emulsion made with an admixture of Asafetida containing twenty per cent. of Ammoniacum, that is from 4 Gms. Asafetida, 1 Gm. Ammoniacum and sufficient water to make the emulsion measure 50 c.c.; also a ten per cent. emulsion made with an admixture of Asafetida containing twenty per cent. of Galbanum, that is from 4 Gms. Asafetida, 1 Gm. Galbanum and sufficient water to make the emulsion measure 50 c.c.

Hypobromite Test.—P. C. Plugge (U. S. D., 17th ed., page 149) states that sodium hypobromite is a sensitive reagent for the detection of Ammoniacum.

The following reagent was used for this test: 40 Gms. sodium hydroxide, 10 c.c. bromine and sufficient water to make 200 c.c.

In applying this test to each of the emulsions mentioned above, about 2 c.c. of the emulsion with 5 c.c. of water were placed in a test tube, the test tube inclined and the reagent allowed to run slowly to the bottom.

With the emulsion of Asafetida, emulsion of Galbanum and emulsion made with mixture of these gums an olive green color was produced. With the emulsion of Ammoniacum a cherry red was produced, with the emulsion of Asafetida with Ammoniacum a distinct transient red was seen when the reagent was added.

Sulphuric Acid Test.—Two cubic centimeters of the Asafetida emulsion was placed in a test tube and thirty drops of cold concentrated sulphuric acid were added. No perceptible change of color took place.

When 2 c.c. of the Ammoniacum emulsion was treated in the same way no perceptible change took place.

When 2 c.c. of the Galbanum emulsion was treated in the same way a reddish violet color was produced.

The following color reactions have been submitted to us as a standard for Asafetida:

Phloroglucin and Hydrochloric Acid; Sulphuric Acid and Ammonia Water.—It was stated that on treating Asafetida with phloroglucin and hydrochloric acid a cherry red was produced. This reaction is also given by the other gums of this class.

It was also stated that Asafetida treated with Sulphuric Acid and neutralized with an alkali, preferably ammonia, a beautiful blue fluorescence would be produced. This fluorescence is due to umbelliferone, a principle characteristic of the gums and resins obtained from the Umbelliferæ with the exception of Ammoniacum, which evidently does not contain this principle. Consequently, neither of these reactions can be relied upon in the detection or identification of these gums.

Thinking that possibly the difference in the appearance, odor or refractive indices of the oils obtained from Asafetida, Ammoniacum and Galbanum might be useful in detecting these gums used as adulterants of Asafetida, we made a steam distillation of each of the following:

1. Gum Asafetida.
2. Gum Ammoniacum.
3. Gum Galbanum.
4. Asafetida with 20 per cent. Ammoniacum.
5. Asafetida with 20 per cent. Galbanum.

Some difficulty was encountered in obtaining the oil from Gum Ammoniacum, as it is only present to the extent of about 0.2 per cent., and boils between 250° and 290° C. This difficulty was, however, overcome by continued distillation, and the application of heat to the flask containing the gum. While this method of heating the flask containing the gum was used in the other cases, this additional heat was probably not necessary when Gum Ammoniacum was not present. Asafetida contains about 4 per cent. of oil and Galbanum about 20 per cent. of oil.

Difference in Appearance of Oils.—The oil from Gum Asafetida is colorless. The oil from Gum Ammoniacum is dark yellow, and has a greater viscosity than any of the others. The oil from Galbanum is light yellow in color. The color of the oils from the admixtures were modified proportionately according to the gums used in the distillation. As noted above, the oil from Asafetida is colorless, and any difference in color noted in distillation of sample of Asafetida should be regarded with suspicion.

In distilling mixtures we noted that Oil of Galbanum came over at about the same temperature as that of Asafetida, but in the case of mixtures containing Gum Ammoniacum the distillation should be carried farther on account of the high boiling point and small amount present. We believe that mixtures of the gums may be detected by the appearance of the oil obtained by steam distillation.

Odor of the Oils.—The oils distilled from these gums have similar odors to the gums from which they were obtained, but it is doubtful if adulteration could be detected with certainty by the difference in odor.

Refractive Indices of Oils Distilled from Samples.—

1. Oil from Asafetida N/D at 25° C.	1.4974
2. Oil from Ammoniac N/D at 25° C.	1.4765
3. Oil from Galbanum N/D at 25° C.	1.4840
4. Oil from mixture of Asafetida and Ammoniacum N/D at 25° C.	1.4959
5. Oil from mixture of Asafetida and Galbanum N/D at 25° C.	1.4929

We would suggest that an oil having a refractive index of less than 1.4960 be considered with suspicion.

It is interesting to note that the refractive index and the specific gravity of Oil of Asafetida are considerably higher than the oils from the other two gums following the well established principle that the higher the specific gravity of an oil the higher will be the refractive index.

We believe the reading of the oils obtanied from the gums to be the more accurate as by distilling the oils some definite principle is isolated which is not influenced by others of which the gums are composed. This method would require elaborate apparatus to carry out, therefore, is not as practicable as the simple color tests suggested, which we believe will indicate the presence of at least 10 per cent. of these adulterants when mixed with Asafetida.

AROMATIC SPIRIT OF AMMONIA.

A METHOD OF ANALYSIS, AND A SUGGESTION FOR A CHANGE IN THE FORMULA.[1]

By Linwood A. Brown, Kentucky Agricultural Experiment Station.

Some months ago the author's attention was called to the unstable nature and the unsatisfactory formula for the official Aromatic Spirit of Ammonia, by having to examine a number of samples collected by the drug inspector for the Kentucky Agricultural Experiment Station.

We have been keeping close watch on those drug preparations liable to undergo change on keeping, not with the intention of catching the druggist in selling a drug below standard, but in order that we might study the effect of storage on preparations of an unstable nature, and hope to be able to be of benefit to the druggists of Kentucky in suggesting to them better methods of keeping their stock of perishable drugs.

So far as the author is aware, there is no published method for the satisfactory examination of Aromatic Spirit of Ammonia, nor does the author claim any originality for the method given in this paper, it being only an adaptation of old methods to meet the needs for this particular preparation.

In the U. S. Pharmacopœia preparation the official ammonium carbonate, which is a mixture of the bicarbonate and carbamate, is converted into the normal carbonate by the hydroxide, forming 40.6 gms. of the normal carbonate per liter, with 4.94 gms. NH_3 per liter as hydroxide in excess. Owing to the fact that the official carbonate rapidly undergoes change, when exposed to the air and more slowly when kept in covered containers, being converted into the bicarbonate, the preparation made from ammonium carbonate, which has undergone this change, will be deficient in ammonium salts, and owing to the volatility of the ammonia from the hydroxide, considerable loss of ammonia gas is liable to occur unless great care is taken in filtering the finished preparation.

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[1] Read before the Division of Pharmaceutical Chemistry of the American Chemical Society, June, 1911.

The method used in the examination of the Aromatic Spirit of Ammonia is as follows:

Twenty-five cubic centimetres of the sample at 15.6° C. are added to about fifty c.c. of distilled water free from CO_2, and contained in a 100 c.c. graduated flask, then filled to the mark with the CO_2 free water.

The determinations to be made are, total NH_3, CO_2, and alcohol.

Total NH_3 and Alcohol.

A 50 c.c. aliquot of the liquid is transferred, by means of a standard pipette, to a 300 c.c. Erlenmeyer flask containing 25 c.c. of normal sulphuric acid, a few pieces of filter paper added to prevent bumping, and the flask connected with a condenser by means of a Kjeldahl spray trap, to prevent any loss of sulphuric acid by being carried over mechanically.

Heat is applied and continued until nearly 50 c.c. of distillate have passed over, the distillate is cooled to 15.6° C., and then made up to the mark by the addition of water, and the alcohol determined by taking the specific gravity at 15.6° C. The small amount of oils (0.15 c.c.) present is not sufficient to interfere to any extent with the determination of the alcohol.

However, if desired, the distillate can be saturated with sodium chloride, and the oils removed by petroleum ether, and the aqueous liquid again distilled and the alcohol determined in the distillate.

Determination of Total NH_3.

The residue remaining in the flask, after washing out the spray trap, is diluted to about 150 c.c. with water, cochineal indicator added and the excess of acid determined by the titration with N/1 KOH.

The number of c.c. of N/1 H_2SO_4 consumed x .01693 x 2 x 4 = gms. NH_3 per 100 c.c. of original sample.

Determination of CO_2.

10 c.c. aliquots of the diluted sample are taken and transferred to 150 c.c. flasks containing 25 c.c. distilled water, free from CO_2, and 10 c.c. saturated barium hydroxide solution added. The flasks are then stoppered with rubber stoppers and allowed to stand for 24 hours at room temperature, or heated by immersing flask in boiling water for 2 or 3 hours, and then cooling.

From this point on, two methods may be used:

The $BaCO_3$ may be filtered off onto a weighed gooch crucible, washed with several portions of water, then with alcohol, dried and weighed.

The weight of $BaCO_3$ x .3989 equals NH_4HCO_3 $NH_4NH_2CO_2$: $BaCO_3$ x .4005 equals NH_4HCO_3.

The gravimetric method has been found to be the most satisfactory, by the writer, and the use of an alundum porous crucible was found to work splendidly in this case.

In case the volumetric method is preferred, filter off the ppt. onto an unweighed gooch, wash well, then place gooch containing ppt. in a 200 c.c. beaker, add 50 c.c. N/10 HCl, heat on water bath until $BaCO_3$ is dissolved, remove gooch, wash and remove asbestos from liquid by filtering through a plug of absorbent cotton in a funnel, wash thoroughly, add methyl-orange to cooled liquid and titrate excess of acid with N/10 KOH.

Each c.c. N/10 HCl consumed equals .0039 gm. $\begin{cases} NH_4HCO_3 \\ NH_4NH_2CO_2 \end{cases}$

Number of c.c. N/10 consumed x .0039 x 10 x 4 equals gms. U. S. P. Ammonium carbonate per 100 c.c. of original sample.

Calculation of Results:

Knowing the amount of total NH_3, and of the ammonium carbonate, in grams per 100 c.c., it is easy enough to calculate the amount of hydroxide present.

Multiply the amount in grams of ammonium carbonate U. S. P. found, by .3255, equals grams NH_3 existing as carbonate.

Total NH_3 minus NH_3 as carbonate, equals NH_3 in form of hydroxide.

The U. S. Pharmacopœia formula calls for 10 per cent. NH_3 by weight, in aqua ammonia, and which has a specific gravity of .960, therefore, multiplying gms. NH_3 as hydroxide, by 10, and dividing by .96 will give cubic centimetres of 10 per cent. ammonium hydroxide per 100 c.c.

In case the CO_2 is determined by the gravimetric method, multiply the weight of $BaCO_3$ by .3989 x 10 x 4 equals grams ammonium carbonate per 100 c.c. of original solution.

This method was tried out in connection with some experiments the author has been carrying out in the study of the rate or deterioration of Aromatic Spirit of Ammonia, with the following results:

Samples, A, B, C, and D were made up, using ammonium carbonate, as free from bicarbonate formation as possible, adhering strictly to the U. S. Pharmacopœia formula for Aromatic Spirit of Ammonia, with the exception that the aqua ammonia used was found to contain 9.39 per cent. NH_3 gas by weight, instead of 10 per cent. as called for.

The preparation was made up at the time, not so much with the idea in view of producing a perfect preparation, but in order to determine the rate of deterioration when kept under certain conditions. For that reason the preparation will be found deficient in ammonium hydroxide, in addition to that caused by loss in filtration. No attempt was made to prevent loss of NH_3 by cooling the solutions; in fact, the U. S. Pharmacopœia does not give any directions to that effect, an oversight that should be corrected in the next U. S. Pharmacopœia.

One liter of the preparation was prepared and assayed, with the result shown in tables for experiments A, B, C, and D, under date of March 27, 1911.

This was divided into four portions of about 250 c.c. each, labelled respectively, A, B, C, and D.

A, was placed in a ground glass stoppered bottle and kept in a refrigerator at a temperature of 10 to 17° C.

B, was placed in the same kind of bottle and kept on a shelf in a laboratory, exposed to a temperature of about 20 to 25° C., except during the recent warm weather, when the temperature went as high as 35° C.; this sample was also exposed to a bright light.

C, was placed in an ordinary 8-ounce bottle and stoppered with a rubber stopper, and kept in a cooler portion of the laboratory, exposed to diffused light.

D, was placed in an 8-ounce bottle and closed with a plug of cotton to keep out dust. This experiment was made to get some idea of how rapidly this preparation would lose in strength if unprotected by a stopper, or by refrigeration.

EXPERIMENT "A."

Date of Assay	Total NH_3 In gms. per 100 c.c.	U. S. P. Ammonium Carbonate. In gms. per 100 c.c.	10 per cent. Ammonium Hydroxide c.c. per 100 c.c.	Alcohol per cent. Absolute Alcohol by Volume.
March 27, 1911....	1.8301	3.3696	7.64	64.50
April 27, 1911.....	1.843	3.354	7.83	66.32
May 27, 1911......	1.8393	3.315	7.92	
June 26, 1911......	1.8298	3.3428	7.73	66.00

EXPERIMENT "B."

Date of Assay	Total NH_3 In gms. per 100 c.c.	U. S. P. Ammonium Carbonate. In gms. per 100 c.c.	10 per cent. Ammonium Hydroxide c.c. per 100 c.c.	Alcohol per cent. Absolute Alcohol by Volume.
March 27, 1911....	1.8301	3.3696	7.64	64.50
April 27, 1911.....	1.8162	3.3196	7.66	65.00
May 27, 1911......	1.800	3.3072	7.54	
June 26, 1911......	1.7742	3.0986	7.07	65.00

EXPERIMENT "C."

Date of Assay	Total NH_3 In gms. per 100 c.c.	U. S. P. Ammonium Carbonate. In gms. per 100 c.c.	10 per cent. Ammonium Hydroxide c.c. per 100 c.c.	Alcohol per cent. Absolute Alcohol by Volume.
March 27, 1911....	1.8301	3.3696	7.64	64.50
April 27, 1911.....	1.8217	3.3696	7.55	
May 27, 1911......	1.8041	3.3072	7.58	
June 26, 1911......	1.8054	3.3348	7.50	65.68

EXPERIMENT "D."

Date of Assay	Total NH_3 In gms. per 100 c.c.	U. S. P. Ammonium Carbonate. In gms. per 100 c.c.	10 per cent. Ammonium Hydroxide c.c. per 100 c.c.	Alcohol per cent. Absolute Alcohol by Volume.
March 27, 1911....	1.8301	3.3696	7.64	64.50
April 27, 1911.....	1.0388	1.6349	5.28	65.64
May 27, 1911......	0.251	0.2028	1.92	
June 26, 1911......	0.0230	trace	trace	59.00

The foregoing is a tabulated list of results obtained in the monthly examinations of the above mentioned experiments, and shows the accuracy of the method, as well as the effect of storage under different conditions.

Owing to the fact that the official ammonium carbonate rapidly changes to the bicarbonate, it was desirable to get some idea as to how rapidly and how completely this change is effected.

A sample of ammonium carbonate, assaying 93.3 per cent. ammonium carbonate by the NH_3 determination, using congo red as indicator in place of litmus, and which by the way is an excellent indicator for the assay of ammonium carbonate in aqueous solution, as it is very sensitive to ammonia in presence of CO_2, but does not work very well in presence of alcohol or the volatile oils found in Aromatic Spirit of Ammonia.

By the CO_2 method, this sample was found to assay 95.91 per cent. ammonium carbonate U. S. P., showing the presence of a small amount of bicarbonate.

Pieces of this sample in translucent condition were placed on a watch glass and allowed to stand exposed to the atmosphere for 24 hours, and then assayed, gave the following results:

By direct titration with acid, using congo red as indicator, equals 99.38 and 98.87 per cent. ammonium bicarbonate.

By CO_2 determination, equals 99.23 and 99.40 per cent. bicarbonate, showing almost complete conversion from the U. S. P. carbonate into the bicarbonate with 24 hours' exposure to air.

A sample of reagent ammonium bicarbonate in hard, translucent pieces, assayed as follows:

By direct titration with acid, using congo red, equals 99.05 per cent. bicarbonate. By CO_2 determination equals $\left\{\begin{matrix}98.00\\97.99\end{matrix}\right\}$ per cent. bicarbonate.

A portion of this sample was exposed to the air, in the same manner as in the case of the ammonium carbonate, and which passed from the hard translucent condition over into the porous friable state in the same way that the official carbonate did.

On assaying this sample we got the following results:

By direct titration with acid, using congo red, equals $\left\{\begin{matrix}99.00\\99.02\end{matrix}\right\}$ per cent. bicarbonate.

By CO_2 determination equals $\left\{\begin{matrix}99.50\\98.54\end{matrix}\right\}$ per cent. bicarbonate.

which shows that in the case of the ammonium bicarbonate, the change is purely a physical one.

A liter of Aromatic Spirit of Ammonia was then prepared, using ammonium bicarbonate in order to determine whether or not the bicarbonate could be substituted for the U. S. P. carbonate, thus giving an improved formula and a more uniform, stable preparation.

The quantities of ammonium bicarbonate and of the aqua ammonia were calculated on the basis of the total NH_3 in the U. S. P. preparation with a slight excess of hydroxide over that called for in the U. S. Pharmacopœia formula.

Ammonium Bicarbonate, 99 per cent., ...	42.0 gms.
Aqua Ammonia (9.98 per cent. NH_3)..............	125.0 c.c.
Oil Lemon	10.0 "
Oil Myristica	1.0 "
Oil Lavender Flowers	1.0 "
Alcohol	700.0 "
Aqua Distilled q. s...............................	1,000.0 c.c.

The aqua ammonia and 125 c.c. water were mixed in a flask, cooled, and the ammonium bicarbonate, in a coarse powder, added; this went into solution very rapidly, and the solution was set aside for about 48 hours in a cool place.

The oils were dissolved in the alcohol, cooled thoroughly and the aqueous solution added very slowly. Allow to come to room temperature, and make up to volume with water, set aside for 24 to 48 hours, then filter through dry filter in covered funnel. This was assayed in the same way as in previous experiments, with the following results:

EXPERIMENT "E."

Date of Assay	Total NH_3 In gms. per 100 c.c.	Ammonium Bicarbonate. In gms. per 100 c.c.	10 per cent. Ammonium Hydroxide c.c. per 100 c.c.	Alcohol per cent. Absolute Alcohol by Volume.
May 27, 1911......	1.9949	4.0339	11.74	64.32
June 26, 1911......	1.9571	4.037	11.32	64.0

Multiply the amount in grams of ammonium bicarbonate found by .2157 equals grams NH_3 existing as bicarbonate.

Conclusion.

It would seem, in view of the fact that ammonium carbonate U. S. P. is of variable composition and difficult to keep, that the use of ammonium bicarbonate, which is very much more stable, and which will answer the purpose in every way, could be used in place of the present carbonate official in the U. S. Pharmacopœia.

The method of assay, as given in this paper, has given satisfaction and has been of great help to the author in the evaluation of Aromatic Spirit of Ammonia samples.

Doubtless, it can be improved upon, but until such time, it is the most satisfactory method, for its purpose, known to the writer.

VARIATION IN THE SUSCEPTIBILITY OF THE GUINEA PIG TO THE HEART TONIC GROUP.[1]

By Chas. E. Vanderkleed, B.Sc., A.C., Pharm.D.

Pharmacologists are divided in their opinion as to the best method for determining the strength of preparations of the digitalis series by biologic means. Many papers have appeared during the last few years advocating the use of this or of that method, but a careful review of the literature shows that, in the opinion of the majority of the workers, the question narrows down to a choice between one of the frog methods, and the guinea pig method of Reed and Vanderkleed. Hatcher's proposed cat method has apparently gained no additional supporters, undoubtedly because of the complexity of its technic.

It is not the purpose of this short communication to discuss all of the many phases and problems of biologic standardization. Attention is called, however, to the fact that the frog methods and the guinea pig method are both toxic or lethal dose methods, and hence, to this extent at least, are amenable to comparison. The question of the effect of the heart tonic drugs on the respiration, in the case of guinea pigs, has been offered as one of the objections to the employment of these animals for the biologic assay of these drugs. This problem has been the subject of an extensive series of experiments during the past summer by Dr. L. T. de M. Sajous, consulting pharmacologist of the H. K. Mulford Company, who will report on this subject during the course of the next few months. He has authorized me to say, however, that in the course of his work, by means of artificial respiration he was able at most only to prolong the life of a guinea pig to which had been administered a minimum lethal dose of tincture of digitalis for from 30 to 40 minutes. Such being the case, he believes that the effect of digitalis on the respiration in the case of guinea pigs does not materially effect the results obtained by the lethal dose method.

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[1] Read before the Boston meeting of the American Pharmaceutical Association, August, 1911.

The most important contrast between frogs and guinea pigs as test animals lies in the claim by advocates of the latter that the susceptibility of the guinea pig, unlike that of the frog, does not vary or does not vary so greatly with climate, temperature, food, season, weight and sex. That frogs do so vary is admitted by the advocates for their employment, as shown by the suggestion by Houghton that crystallized strophanthin be employed as a standard for checking the susceptibility of each lot of frogs employed in the standardization of a preparation of unknown strength. (See also Hygienic Laboratory Bulletins Nos. 48 and 74 by Edmunds and Hale.) On the other hand, Haskell[2] has recently claimed that the advocates of the guinea pig method have only half-heartedly claimed that guinea pigs do not show the same variations. Thus he quotes Reed as saying that the guinea pig " does not *appear* to offer so wide a variation "; Githins as saying that the guinea pig "*shows* no such variation "; and the Philadelphia committee on pharmacologic assay as stating that the susceptibility of guinea pigs to digitalis does not vary under ordinary conditions, "*so far as is known.*" The effect of Haskell's quotations is to create the impression that these advocates of the guinea pig as a test animal were not at all *convinced* of the superiority of the guinea pig over the frog in this respect, and he goes on to show the possibility of a great variation in the susceptibility of guinea pigs, *to digitalis,* by mentioning an article by Arms[3] entitled " Some Freak Results from Animal Inoculation " in which that author reported on the effects of inoculations of guinea pigs with glanders, and with emulsion of nervous tissue from rabid dogs! The irrelevancy of such experiments to the question at issue only seems to indicate an *a priori* prejudice against the employment of the guinea pig. Haskell's further observation that the advocates of the guinea pig method have put forth unusual efforts to discover defects from the unfitness of the frog, seems to be paralleled by his implied unfitness of the former animal.

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[2] AMERICAN JOURNAL OF PHARMACY, May, 1911, p. 201.

[3] *Journal of Public Hygiene,* xix, No. 3.

Taking up the objections to lethal dose methods in general, Haskell further states that "the active glucosides of digitalis may become decomposed into such bodies as digitalresin and toxiresin, which, resembling picrotoxin, have a depressant action on the heart, and a preparation containing a large amount of such decomposition products, while testing high by lethal dose methods, might not only be below standard, but capable of causing dangerous poisoning." In support of this possibility he quotes Edmunds and Hale in their Bulletin No. 48 of the U. S. Public Health and Marine-Hospital Service, as follows: "One solution might be very weak in its action upon the heart and yet contain decomposition products of digitalis whose typical action is upon the medulla, and it would, therefore, appear unduly strong when judged by such a standard. For this reason, we think that methods which employ as a standard the minimum lethal dose upon the higher animals are not applicable to the physiological assay of the digitalis series."

In this bulletin, however, these authors offer no evidence to show that such a condition ever obtains; on the contrary, a study of their experiments shows that they observed cases in which preparations containing large amounts of decomposition products and producing but a small or even a negative rise in blood pressure, were administered in doses four times as great as the minimum lethal dose of an active preparation without causing any symptoms whatever in guinea pigs, and they observed other cases in which such preparations were injected in doses eleven times as great as the minimum lethal dose of an active preparation without causing death. This objection to lethal dose methods, therefore, does not seem to be sustained, or at least remains to be proved. Moreover, if the minimum lethal dose method be checked by a chemical assay for digitoxin, an additional safeguard against the possibility of wrong interpretation of the physiological results is provided.

Haskell, however, goes on to say, "Doubtless, numerous investigations have been carried out to show that guinea pigs do not vary in their resistance to digitalis intoxication, but I have been unable to find the report of a single series of experiments performed with the object of showing that guinea pigs are not fully as much influenced by adventitious circumstances as are frogs." This, being a perfectly rational and legitimate challenge, I shall endeavor to answer it, first, from a review of records of some hundreds of guinea pig injections, and secondly, by the preliminary account of a series of experiments started in July, 1911, and so planned as to cover one complete revolution of the seasons. The complete report of this series of experiments can of course only be given twelve months hence,—but some preliminary data have already been collected and may be of interest here.

Reverting to the records of guinea pig injections above referred to, I would state that the conclusions as guardedly expressed, and properly so as becomes scientific investigators, by Reed, Githens, and the Philadelphia Committee, were based upon the fact that, in the course of hundreds of injections, *apparent* variations in susceptibility were so few as to be, on the whole, negligible. In these experiments, guinea pigs bred and raised by no less than a dozen different breeders were employed. The pigs, once aggregated from these various sources, were of course subjected to approximately the same general conditions, but no unusual means of preserving uniformity were employed. Seasonable food was given them, principally oats and hay together with greens such as lettuce, carrot tops, cornstalks, cabbage, etc., in season. The temperature change to which they were subjected was that of Philadelphia, which as is well known, is a considerable one. In winter, the general guinea pig quarters are heated to 65° or 70° F., while the rooms into which they are transferred during the time of testing are heated to about 75° F. Thus, no *particular* attention is paid to the question of source, food, or temperature, nor, in the hundreds of injections made in our laboratories are any selections made as to sex. The weight of the individual animals employed has ranged from 225 to 500 gms.—the dose given being always calculated on the basis of 250 gm. weight. In spite of the lack of attempting to systematize the conditions under which the animals are kept, and tested, the percentage of non-concordant results obtained has been well within 5 per cent. By this is meant that, in finding the minimum lethal dose of any preparation down to a variation of 10 per cent., and in most cases, much less than 10 per cent., a series of pigs, taken at random, and given injections of progressively larger doses, *all* receiving a certain dose or more, will die, and *all* receiving a smaller dose will recover. A second smaller series is always injected to check the results of the first series, and as stated above, not five pigs in one hundred have been found to die with a smaller dose than that found as the m.l.d. in the first series, or to recover, when given a larger dose—the doses being increased successively in tenths.

It was upon this evidence that the guarded opinions expressed by Reed, Githens, and the Philadelphia Committee were based. In addition to the above variations, another variation not heretofore brought out has been noted. As is well known, the guinea pig is the official test animal employed in the standardization of sera such as diphtheria antitoxin. That its use for this purpose leads to unquestioned uniformity of product is universally acknowledged, and officially sanctioned by the U. S. P. H. and M. H. Service. In the course of standardizing sera, large numbers of pigs survive, but cannot be used again for testing sera. The question naturally arose as to whether such pigs could be used for the standardization of the heart tonics. Series of such pigs have been repeatedly used along with previously unused pigs and no change in their susceptibility to digitalis and the other heart tonics noted. It is only essential that they be in good physical condition and fully recovered from the physical injury inflicted by the prior injections of toxins and antitoxin.

Taking up now the experiments started in July, I would state that the principal advantage of the guinea pig over the frog lies in the claimed non-necessity for employing and keeping on hand a "standard" against which the susceptibility of the animals must be checked. If this advantage cannot be sustained, the guinea pig method loses one of its more important claims to superiority, although it possesses some other advantages over the frog which in turn are met with certain minor disadvantages, such for example as that of cost. Confining ourselves, however, to the main question at issue, I will outline the nature of the experiment being conducted, and give a summary of results so far obtained.

The experiment has been undertaken to show what effect, if any, season (and incidentally temperature), food, weight and sex have upon the susceptibility of the guinea pig to digitalis intoxication. Recognizing the difficulty and uncertainty of keeping a standard digitalis absolutely unchanged throughout one year (and any change whatever would of course nullify the value of the experiment), I have adopted as the standard preparation to be employed, crystallized ouabain which has been selected by advocates of the frog methods for the purpose of standardizing their test animals.

The experimental pigs have been divided first into two classes as regards sex. Each of these classes has been further subdivided into two classes as regards weight,—those ranging from 225 to 275 gms. and those ranging from 350 to 500 gms.

Each of these sub-classes was at first further sub-divided into two classes as regards food,—one class receiving for two weeks prior to the test, nothing but oats,—the other class receiving during the same time nothing but greens. It was soon discovered, however, that the pigs receiving nothing but greens easily succumbed to the unusually torrid weather which prevailed in Philadelphia and in many other parts of the country during July. Greens alone appeared to possess an insufficient amount of nourishment to maintain the animals in healthy physical condition,—several deaths occurring in the cages.

The differentiation as regards food was therefore discontinued, the fact having been proved to us that test pigs must be fed upon grain (oats) as well as upon greens in season, and that the grain is the more important. This fact, however, does not in itself discredit the guinea pig as a test animal, since we are limited very much in any case in the variety of foods which this animal will eat.

A further important observation was made during this exceedingly hot month of July. We discovered that a factor of more importance than temperature on the health of guinea pigs is ventilation,—fresh air. Our main supply of pigs is kept under conditions already described in the country. For the purpose of making these and other tests, the pigs are brought into the city, where the problem of housing and ventilation is a more difficult one. During the July 4th vacation several deaths occurred in the cages, particularly among the pigs fed on greens, and it was found that these were in fact caused by the partial lowering of the windows in their quarters by the attendant during this period, as a precaution against fire from rockets, etc. However, all this only goes to show what all pharmacologists concede, that in any biologic assay whatever, normal healthy test animals are the first requisite.

The seasonal variations will of course be shown by any differences in results noted during the year. Tests are to be made and a new series of pigs in each of the four classes selected for the tests each month.

Thus at the end of the year, we shall have 12 sets of experiments showing the m.l.d. or resistance to crystallized ouabain, of 4 different kinds of guinea pigs, or 48 tests covering an entire year's variation in season and, to a certain extent, temperature. Moreover, if found practicable, we shall have from time to time lots of pigs shipped to us from various sections of the country,—thus introducing the factor of climate.

Up to the present time, only one set of tests has been made, the results obtained being shown in the following tables. The doses given are in grams per 250 grams body weight.

SMALL MALES, WEIGHING 140 TO 210 GMS.

Dose	Weight	Result
0.000040	195	— Recovered
0.000044	200	— Recovered
0.000047	175	— Recovered
0.000050	155	— Recovered
0.000050	210	— Recovered
x 0.0000525	205	+ Died
0.000055	195	+ Died
0.0000575	190	+ Died
0.000060	140	+ Died
0.000069	170	+ Died
0.000072	185	+ Died

M.L.D. = 0.0000525.

LARGE MALES, WEIGHING 270 TO 410 GMS.

Dose	Weight	Result
0.0000375	285	— Recovered
0.0000400	310	— Recovered
0.0000440	410	— Recovered
0.0000470	320	— Recovered
0.0000470	305	+ Died
0.0000500	270	— Recovered
0.0000500	370	— Recovered
x 0.0000525	315	+ Died
0.0000550	310	+ Died
0.0000600	345	+ Died

M.L.D. = 0.0000525.

SMALL FEMALES, WEIGHING 160 TO 210 GMS.

Dose	Weight	Result
0.00004	170	— Recovered
0.000044	210	— Recovered
0.000044	190	— Recovered
0.000047	160	— Recovered
0.000047	170	— Recovered
0.00005	180	— Recovered
0.00005	180	+ Died
x 0.0000525	195	+ Died
0.000055	175	+ Died
0.0000575	180	+ Died
0.00006	160	+ Died

M.L.D. = 0.0000525.

LARGE FEMALES, WEIGHING 260 TO 350 GMS.

Dose	Weight	Result
0.0000375	260	— Recovered
0.00004	265	— Recovered
0.00004	335	— Recovered
0.000044	295	— Recovered
0.000044	350	— Recovered
0.000047	260	— Recovered
0.000047	295	+ Died
x 0.00005	350	+ Died
0.00005	285	+ Died
0.0000525	300	+ Died
0.00006	275	+ Died

M.L.D. = 0.0000500.

Thus, it may be seen that male and female pigs ranging in weight from 140 to 410 gms. have shown a minimum lethal dose of about 0.0000525 per 250 gm. body weight, in the first month's tests. Out of 43 pigs in the series only one, (the large male which was killed by 0.000047 gm. per 250 gm. body weight while two other pigs receiving 0.00005 gm. per 250 gm. body weight recovered) died "out of order."

The m.l.d. for small females was considered to be 0.0000525, because, of two pigs receiving 0.00005 gm., one died and one recovered. The m.l.d. for large females was considered to be 0.00005 because, of two pigs receiving 0.000047 gm., one died and one recovered.

The variation in results obtained from month to month will in due season be published, and I trust that they may go far toward establishing the degree of variation in the susceptibility of these little animals to the heart tonic drugs which should be expected.

As a matter of possible interest, the minimum lethal dose of the ouabain used in the guinea pig experiments was determined by Houghton's "one-hour" method for three classes of frogs as follows:

Male Leopard Frogs (*Rana pipiens*) from Illinois.

Weights ranged from 38.5 to 57.5 gms. Temperature of water in frog tank 26.5° to 29.5° C. Temperature of room 25.5° to 28.5° C. The doses given are in grams per gram body weight.

Dose	Weight	Result
0.000,000,30	42.0	— Beats
0.000,000,31	40.0	— Occasional beat
x 0.000,000,32	45.5	+ Stopped. Extra contraction on stimulation
x 0.000,000,32	55.0	+ Stopped. Extra contraction on stimulation
x 0.000,000,32	56.5	+ Stopped. Extra contraction on stimulation
x 0.000,000,32	57.5	+ Stopped. Extra contraction on stimulation
0.000,000,33	42.5	— Non-absorption
0.000,000,34	38.4	+ Stopped. No extra contraction on stimulation
0.000,000.34	44.0	+ Stopped. No extra contraction on stimulation
0.000,000.36	45.0	+ Stopped. No extra contraction on stimulation
0.000.000,39	40.0	+ Stopped. No extra contraction on stimulation

M.L.D. considered to be 0.000.000,32.

Female Leopard Frogs (*Rana pipiens*) from Illinois.

Weights ranged from 30 to 62.3 gms. Temperature of water in frog tank 26.5° to 29.5° C. Temperature of room 25.5° to 28.5° C.

Dose	Weight	Result
0.000,000,36	40.0	— Beats
0.000,000,36	34.0	+ Stopped
0.000,000,37	34.0	— Slight beat in auricle
0.000,000.37	43.5	— Slight beat in auricle
0.000,000,37	36.0	— Beats
0.000,000,38	37.5	— Beats
0.000,000,38	34.0	— Beats
x 0.000,000,38	30.0	+ Stopped. Extra contraction on stimulation
x 0.000,000.38	37.5	+ Stopped. Extra contraction on stimulation
x 0.000,000,38	62.3	+ Stopped. No extra contraction on stimulation
0.000,000,39	50.5	— Beats
0.000,000,39	66.6	— Auricles still contracting
0.000,000,39	37.0	+ Stopped. Extra contraction on stimulation
0.000,000,39	46.0	+ Stopped. No extra contraction on stimulation
0.000,000,39	48.0	+ Stopped. No extra contraction on stimulation
0.000,000,40	40.0	+ Stopped. No extra contraction on stimulation

M.L.D. considered to be 0.000,000,38.

FEMALE BULL-FROGS (*Rana catesbiana*) FROM PENNSYLVANIA.

Weights ranged from 38.5 to 54 gms. Temperature of water in frog tank 24.5° to 26.5° C. Temperature of room 24° to 25.5° C.

Dose	Weight	Result
0.000,000,36	48.2	— Beats
0.000,000,40	41.0	— Beats
0.000,000,45	41.0	— Beats
0.000,000,47	43.0	— Beats
0.000,000,50	42.0	— Auricles still contracting
0.000,000,51	38.5	— Auricles still contracting
x 0.000,000,52	39.6	+ Stopped. Extra contraction on stimulation
x 0.000,000,52	40.0	+ Stopped. Extra contraction on stimulation
x 0.000,000,52	40.5	+ Stopped. Extra contraction on stimulation
x 0.000,000,52	38.5	+ Stopped. Extra contraction on stimulation
x 0.000,000,52	48.5	+ Stopped. Extra contraction on stimulation
0.000,000,53	40.5	— Non-absorption
0.000,000,53	48.0	+ Stopped. No extra contraction on stimulation
0.000,000,53	54.0	+ Stopped. No extra contraction on stimulation

M.L.D. considered to be 0.000,000,52.

It appears therefore that in the above experiments the minimum lethal dose for the three classes of frogs varied as follows:

Male frogs (*Rana pipiens*) from Illinois..........	0.000,000,32
Female frogs (*Rana pipiens*) from Illinois.......	0.000,000,38
Female bull-frogs (*Rana catesbiana*) from Pennsylvania	0.000,000,52

or, the lethal dose for female frogs from Illinois was about 19 per cent. greater than for male frogs from the same locality, while the lethal dose for female bull-frogs from Pennsylvania was 62.5 per cent. greater.

In conclusion I wish to acknowledge my indebtedness to Dr. P. S. Pittenger and Mr. Leo Glickman for assistance in carrying out the experimental work.

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Philadelphia, Pa.

THE THIRTY-SEVENTH ANNUAL CONVENTION OF THE NATIONAL WHOLESALE DRUGGISTS' ASSOCIATION.

By C. Mahlon Kline, Ph.B.

The Thirty-Seventh Annual Convention of the National Wholesale Druggists' Association was held last month in New York City, and, as might be expected, was very well attended. Everybody apparently at periodical intervals is looking for an excuse to go to New York, and eagerly grasped the opportunity afforded by the annual convention of the Association. There are a number of things to do in New York in addition to business matters, and when not absent from the meetings myself, noticed with regret that a number of others were. Nevertheless, in spite of the manifold attractions, the meetings were, on the whole, well attended and the discussions fairly lively.

The Hotel Astor afforded accommodations which, to my mind, were above reproach. In fact, I cannot imagine the possibility of better service, because perfection cannot be excelled.

We were particularly fortunate in having as our presiding officer, Dr. William Jay Schieffelin, a descendant of one of the most distinguished New York families, the Jays, and who is connected by marriage with another famous New York family, the Vanderbilts. Dr. Schieffelin stands out conspicuously in New York City as an advocate of what is best and cleanest in politics. He is also a distinguished lay worker in church circles. So also in pharmacy he employs the force of a more than usually winning personality in the support of those measures that tend to increase the honor and high standing of all branches of the drug trade. The Association has been very fortunate in having such a man at its head, and as chairman of its important committees, and it is very pleasing to know that Dr. Schieffelin always stands ready to assist the wholesale drug trade in maintaining its honorable position in the community.

President Schieffelin in his address touched upon many problems which are to-day agitating our country. I will not attempt to mention them in this paper, as they are constantly in the daily press, and would consume too much of your time. Dr. Schieffelin in his address said in regard to narcotic legislation: "We who are in the drug business feel the responsibility involved in dealing in these habit-forming drugs. None of us wish to make money by selling drugs which will harm our fellow men. We cannot with a clear conscience try to prevent the passage of effective measures to control the sale of narcotics, nor is it enough for us to express our approval of such legislation and then use no effort to secure its enactment. It is our duty to be familiar with the facts regarding the effects of these drugs and the extent of their use." In this statement he clearly voiced the sentiment of those present and later a special committee was selected to assist in the enactment of desirable narcotic laws in the states and by the National Government.

Dr. Schieffelin also said in his address: "We should not confine our attention to drugs alone, because certain so-called soft drinks fortified by the addition of caffeine, on account of their habit-forming character, are a menace. There can be no doubt that their promiscuous sale to children should be stopped." He strongly advocated the establishing of a National Department of Health, because health is the most valuable asset of any nation, and there can be no more effective method of conserving human life than the spreading of sanitary knowledge by such a department of our National Government.

Among the committees to report to the Association was one presided over by a gentleman well known to you all, Dr. Adolph W. Miller, of the Committee on Drug Markets. Dr. Miller gave as his reasons for the general increase in the cost of drugs, a fact which has been forcibly brought to the attention of most of us, firstly and indirectly, the very heavy increase in the production of gold. As direct causes, the construction of the Panama Canal, requiring vast quantities of dynamite, the imposition of a tax on Cannabis Indica by the British Government, partial failure of the wine crop in France (resulting in a diminished supply of argols), the purchase of practically all of the supplies of Tonka Beans by the Tobacco Trust, the government aid extended to the citrus industry in Sicily, and the appearance of Cholera in the Mediterranean ports, producing a strong demand for Carbolic Acid and other bactericides; also, the fact that many drugs are being rejected at ports of entry and returned, making it necessary for the shipper to cover his loss by higher charges. A study of the report by items shows an advance on practically everything. Some articles seem to have reached double or triple figures.

Mr. Albert Plaut, a man generally known to possess the most accurate knowledge of medicinal substances and their market values, made a few interesting remarks in commenting on Dr. Miller's report, which I shall summarize as follows: He said that he thought that the value of drugs and medicines had increased less in the last 15 years than any other commodity. "During the current year there have been a large number of increases and I have remarked, when discussing the subject, that at last the drug trade was coming into its own, that we were also getting our fair share of the depreciation of the value of gold and the consequent increase in price of commodities. I hold that drugs are sold entirely too low in price, and that the countries where the various drugs are indigenous are superlatively foolish in selling these goods below their real value. Take the American indigenous drugs produced chiefly in the South; the dried roots are sold right along at from 3 to 8 cents a pound. How human labor can be adequately paid for gathering dried roots to be sold at from 3 to 8 cents a pound is beyond my comprehension."

Mr. Plaut mentioned as examples of drugs which have heavily increased in value owing to crop conditions, Buchu, which sold for 30 years all the way from 6 to 12 cents a pound; then came a crop failure, speculators took hold of the product and it sold as high as $1.00 a pound, and he ventured to say that it will never again be below 40 or 50 cents a pound. Golden Seal Root is another one. Mr. Plaut said he could remember when Golden Seal was 9 cents. For years it sold from 18 to 20 cents, then for years around 85 cents, at the present time it is $5.00 a pound. He ventured to prophesy that we will never see the low prices again. Mr. Plaut thinks the Food and Drugs Act has something to do with the increase in the cost of drugs, because it is no longer possible to market drugs which have been carelessly collected, and higher prices must be obtained in consequence.

I think you will also be interested in a part of the report on paints, oils and glasses, Mr. Levi Wilcox, of Waterbury, Conn., Chairman. He called the attention of the Association to Lard Oil, official in the U. S. P., Eighth Revision. Mr. Wilcox said that the purchase of this product by one not an expert is quite a difficult problem. One may solicit quotations for prime lard oil from half a dozen different sources at the same time, and have a different price named by each one, and should he purchase a barrel of each of the oils offered, he might find as many different qualities of oil, varying from the finest selection of prime winter strained oil down to a poor off-prime oil adulterated with 50 per cent. of petroleum. To prove the truth of this assertion, Mr. Wilcox made a series of such purchases with results exactly as stated above. The conclusions are:

1. That there are no definite legal standards of equality for the different grades of lard oil.

2. That each producer or dealer selects and classifies his lard oil by his own standard tests, and according to his own ideas.

3. That the commercial names, prime, off prime, No. 1, etc., established by custom for marketing the different grades of lard oil indicate little as to the actual quality of the oil.

In fairness it should be said, however, that lard oil purchased direct from the large packing houses is usually of the highest quality. Mr. Wilcox suggests as a cure for this condition, that the producers of lard oil should adopt a series of standard tests of the different grades. Mr. Wilcox further states that the whole subject of adulteration of products not covered by the Pure Food and Drugs Act, will be eventually covered by a general statute forbidding misrepresentation of chemicals, oils or other commercial articles.

In objecting to such legislation there is the argument that such laws are useless duplications of existing statutes, under which fraud is already a crime. Mr. Wilcox argues that the answer to this is that the new law should make it a duty of the State to investigate, whereas, under the present law prosecution for such misrepresentation has to be instituted by the individual.

If I might be pardoned for injecting an opinion on this subject, I am more in sympathy with those that doubt the advisability of such legislation than with Mr. Wilcox. It seems to me in these days that there is a tendency to pass many laws which add but little to the common law already in existence, and do but complicate and interfere with business. I am rather inclined to object to a paternal government. The citizens of this country have done unusually well so far by an exercise of their wits. It seems to me that too much paternity on the part of the government does away with the necessity for the exercise of individual brains. It makes the inhabitants lacking in the ability to take care of themselves.

My remarks, however, are not intended to apply to Foods and Drugs where the health of the inhabitants are at stake. The legislative function of government is intended for just such a purpose, the guarding of the public health, police powers and the protection of property. It seems to me desirable to think very seriously before we extend government control by the standardizing of all products, such as cloth, measuring vessels, building materials and a million and one other commodities that figure in our transactions. Let the American citizen depend on his own brains and permit him to do his own choosing. It seems to me he will be a better man for the experience, but do not allow him to become the prey of the food and drug adulterators who strike at his health.

Mr. Lilly, Chairman of the Committee on the Prevention of Adulteration, presented, as might be expected, a very able report. He was very optimistic. He thought that deliberate adulteration of drugs has become so rare as to be almost a thing of the past, and that where adulterations were traced to their source, they proved to be due almost invariably to ignorance on the part of the collector. Mr. Lilly's opinion does not agree with that of the President of the Association of State Food and Drug Commissioners, whom I heard announce before a meeting of the National Civic Federation recently that he was firmly convinced that 60 per cent. of all the medicines sold to-day were adulterated. How such blind ignorance could exist in the mind of a man occupying so important a position, is to me absolutely without excuse. People in positions of authority should inform themselves first of facts and talk afterwards. The number of words in circulation would thus be very remarkably diminished.

Mr. Lilly, on the other hand, realizes and says, that progressive business men, aided by a growing number of scientists, have for years been elevating the standards and eliminating adulteration. This I think is very correct. It is not that people deliberately adulterate, but they are misled through ignorance where there are no standards in existence. Wherever these men are shown the right, they follow it with avidity. Again, it must not be forgotten that our ignorance to-day of medicinal substances is appalling. Until the darkness of this ignorance is dispelled, how can we expect to reach protection!

Mr. Lilly says that most of our difficulties now come from indigenous drugs. Gatherers of crude drugs in our own country are not often educated botanists, hence it is not to be wondered at that admixtures with other drugs should occur. He mentions Wild Cherry Bark as a case where the forbidden old Bark will be stripped and mixed with the young bark. This, however, seems to me to be deliberate and not the result of ignorance. He mentions also the adulteration of Hydrastis with the twin leaf root, because of its high price and scarcity. Leptandra continues, he says, to be a favorite vehicle for soil, gravel and chicken feathers. The second year woody roots of Lappa continue to be mixed with one year root. Spigelia is difficult to secure free from wrong species and strange rhizomes.

Mr. Lilly mentioned the important fact, which I have previously dwelt upon, that knowledge of drugs in many cases has made little or no progress for years, in spite of a great advance made in our knowledge of medicines as a whole. He takes as an example Stillingia; he says there is some truth in the statement that it loses its therapeutic value rapidly upon drying and becomes inactive within a year. He says, however, that this is a surmise, and it would require years of elaborate study before coming to a definite conclusion. He brings up this point to illustrate that a correct standard cannot be established until our knowledge of the particular drug has reached the point of reasonable completeness. This, it seems to me, is the most important matter Mr. Lilly brings us in his report. There is not nearly enough time and money spent on investigating our usual drug substances. Hardly one of them can be considered without some question arising in connection therewith, and a search of the existing literature will not bring a reply.

Mr. Lilly dwelt upon the difficulty experienced by analysts in securing samples for assay. Large lots are frequently made up of assembled small lots brought in by different growers or collectors, perhaps collected and mixed in widely separated localities. These lots when placed in bags or pressed into bales present a problem to the chemist. A standard method for preparing such samples is being discussed by analysts, and it is to be hoped that an effective method may become official. It seems to the writer that in many cases it will always be impossible to obtain uniform samples without taking the entire lot and grinding it into a powder and then mixing the powder, or, in the case of soft and unctuous materials, mixing them in a large machine until they become homogeneous, which procedure would not be, of course, practicable.

Speaking about Asafetida, Mr. Lilly said: "Surely Powdered Asafetida should be abolished. The heat necessary to dry and the unavoidable admixture of gypsum or other diluent in large proportions makes the product undesirable. Here is quality sacrificed to convenience and should be abolished." The writer must say that he cannot see any possible excuse for the existence of Powdered Asafetida. He is informed that this product depends almost entirely for its activity on its volatile constituents, which are partially or entirely driven off in the drying. Why then should any one who has knowledge of the facts employ this powder in the important conditions in which Asafetida is employed?

Mr. Lilly concludes—and his conclusions are very pleasing—"To sum up the situation as to the adulteration of drugs in the United States, your committee feels that by continued alertness on the part of the government examiners, the growing habit of dealers and manufacturers of carefully examining their crude materials and rejecting all those below standard, together with the increased co-operation of wholesale and dispensing druggists who are as a rule possessed of a sincere desire to supply the people of this country with the best drugs obtainable, that the situation is increasingly gratifying. Where all are struggling for better things the desired goal will surely be reached."

The association had the good fortune to be addressed by Dr. Rodney H. True, the physiologist in charge of the Bureau of Plant Industry of the Department of Agriculture. Dr. True addressed the association on the subject of what is now being done toward encouraging the artificial growing of drugs in the United States. This is one of the very important undertakings of the United States Department of Agriculture, and one which we all hear about with the very greatest interest. Much of the loss of reputation under which drug substances have suffered in the past is undoubtedly due to lack of knowledge of the drugs themselves. The investigations of the Department not only make it possible for the inhabitants of the United States to reap some of the golden harvest previously sent abroad, but lead to the discovery of many points in regard to growth, age and method of collection that are very certain to lead to greater uniformity. Dr. True mentioned as drugs which were of sufficient value to make experimentation worth while, Ginseng, of which this country exports from $1,000,000 to $1,500,000 a year to China; Golden Seal, Cannabis Indica and Senega Root. Ginseng has to be grown under artificial shade. Apparently the results have been most encouraging, Dr. True mentioning the possibility of a harvest of $10,000 per acre.

Golden Seal also has to be grown under shade. Dr. True said it is being planted in rotation with Ginseng all over the Northeastern part of the United States. He says, however, that the growers have been so much impressed with the market advances on

Golden Seal that they prefer not to gather, but are using the present plants for the purpose of propagation, and that the artificially home grown drug, though at present in existence in sufficient amount to relieve the present stringency, will probably not be gathered until the growers think the market has reached its highest point. This has been the experience with Ginseng. "You have seen," he says, "how *long* Ginseng has been coming on the market; the reason has been the increasing prices. For the past few years it has *not* been increasing in price, so now the cultivated roots have begun to appear." The value of Ginseng has reached an approximate level, which the growers have realized, and they have put it on the market. How long it will be before the same situation applies to Golden Seal is impossible to state.

Dr. True says the Department is having very gratifying results on Cannabis Indica, which grows very nicely in Maryland and in a very considerable part of the United States. He said that they had settled down to experiment work in South Carolina and in the vicinity of Washington; that they had made extracts and applied tests to dogs and found the Indian Hemp grown in Texas and in the neighborhood of Washington like effective, as effective as good standard extracts bought from the most approved sources. One serious handicap in the growing of Indian Hemp is that the United States Pharmacopœia states that Indian Hemp must come from the East Indies.

Dr. True said that, in collaboration with Dr. Hale of the Hygienic Laboratory, they worked on Digitalis Leaves at the Arlington Experiment Station, and found that the first year Digitalis Leaves are as effective as those produced at the time of flowering. (The U. S. P., you will recall, recognizes only the second year leaves.) Dr. True, however, did not know whether this would be the case every time, but they have reason to believe that the first year's leaves will meet the physiological requirements.

He did not speak very encouragingly about other drugs of smaller value. Apparently, at least for some years to come, the only drugs in which the growers can be made to take an interest are those of considerable value, as American growers are unsatisfied with the possibility of small returns.

Dr. True discussed the difficulty of matching climatic conditions, using Opium as an example; he attempted to grow poppies for Opium in Florida with poor results, and after three or four more guesses found by far the best location to be in the State of Washington near Spokane. He said that he would not have thought at first that this location would parallel the conditions in Asia Minor. The growing and curing of Vanilla Beans did not look promising as far as they had gone. Dr. True spoke in a very encouraging way of the success they are having in the propagation of Camphor trees in Florida.

The most important consideration brought up by the Committee on Legislation, Chairman, Mr. Chas. A. West, was uniformity in legislation. The United States has now grown beyond the provincial stage and so, naturally, the business of the United States has also grown until the large dealers have representatives in every State in the Union. This is as it should be, and tends to bring about those economies which should ultimately redown to the advantage of the consumer, though so far they do not seem to have done so. In any event, a manufacturer should be able to market his goods freely in every State in the Union. Lately, however, the 48 legislatures, meeting every two years, have found it necessary to consider, and at times pass, all sorts of ill-advised legislation, regardless of national conditions. This is recognized to-day by the business community as one of the most serious problems that confronts us, threatening the prosperity of our country. The National Civic Federation has shown a progressive spirit by organizing committees throughout the United States to make legislation, as far as possible, uniform. We have been fortunate so far in getting comparatively uniform laws on foods and drugs, though there have been many narrow escapes from legislation which would have interfered with this uniformity.

Mr. West looks with apprehension upon the Narcotic Bills that have been introduced in Washington during the extra session and the session that preceded it. He thinks that these bills approach the subject from the wrong standpoint. They make it necessary for the shipper to keep elaborate and cumbersome records and to make himself responsible, to a certain extent, for the character and actions of the man to whom he ships. Whereas, it is very evident, that it is the purchaser of drugs of this character who is the dangerous man, and he is the person who should be made responsible for the disposal of the narcotic drugs which he has purchased.

It seems to me that Mr. West's position is most reasonable. Part of his statement, which seems very important to me, I quote from the stenographer's report of the proceedings. It is as follows:

"It seems to your committee that the course for this Association to pursue is to submit some compromise measure that will be quite as likely to accomplish the purpose of these drastic bills, and at the same time not make it dangerous for a reputable citizen to engage in the business of manufacturing and wholesaling drugs. The question arises: Is not one who is disposed to buy from a dealer in another State for the purpose of evading the laws of his own State the one for the legislator to reach? The manufacturer and wholesaler shipping hundreds of orders every day has no possible opportunity of knowing who are, and who are not, buying for lawful purposes; but the dealer cannot import a drug into his State for the purpose of evading the State law innocently; therefore, might it not be wise to submit, as meeting the evil claimed to exist, a measure which shall reach the dealer importing for unlawful purposes? A Federal act might be passed first forbidding anyone not a manufacturer, a wholesaler, a retailer and perhaps a physician, dentist or veterinarian, from importing the prescribed drug into his State from any other State; and the same law might require the manufacturer, dealer, etc., lawfully importing from other States to transmit to the collector of internal revenue for his district a copy of his order, which such collector might keep filed for the information of the local authorities. This would impose little, if any, hardship upon those introducing into the State from other States, since such orders are infrequent; while this simple proceeding would accomplish every purpose that either the Mann bill or the Foster bill is intended to effect."

In conclusion, I would say that, to my mind, the meeting of the National Wholesale Druggists' Association shows very clearly the tendency of the times. The wholesale dealers of 10 years ago were not, nor did they have to be, familiar with the professional side of pharmacy. This condition is not true to-day. The wholesaler has been compelled to assume responsibilities as to the quality of the drugs and medicines he handles, and this has driven him to interest himself in the study of drug substances, therefore, discussions having to deal with quality, standards, scientific methods of production or handling, are now heard with the greatest interest, and the purely commercial side has been forced to recede somewhat from its former pre-eminent position. This I think is bound to result in considerable benefit to the consumer of medicinal substances. As Mr. Lilly has said: "Where all are struggling for better things, the desired goal will surely be reached."

THE THIRTEENTH ANNUAL CONVENTION OF THE N. A. R. D.

By William E. Lee.

The Convention of the N. A. R. D. at Niagara Falls was to my mind one of the most successful conventions that it has been my privilege to attend. It was a representative body of the retail druggists of the United States, truly national in its character. Anyone who has not attended a national convention of the N. A. R. D. has no idea what they have missed. It is not only the sessions of the convention by which you are benefited, but the meeting with fellow druggists from different parts of the country; exchanging ideas, becoming acquainted with each other, also the satisfaction of knowing that druggists are among the most enterprising citizens of this country. Here you meet the men that have been successful in their business and their profession, and are always ready and willing to give any desired information. The time and money spent by druggists is conclusive evidence of their loyalty to their profession.

I have in mind one man in particular who rode twenty-five miles on horseback to get to a railroad station to attend the convention at Niagara Falls. I might say that he was from Kentucky.

The addresses were interesting and instructive, among them was one by Professor Beal, the delegate from the A. Ph. A., which was listened to with marked attention and was thoroughly appreciated.

The movements tending to Sunday Closing and Shorter Hours for Pharmacists were approved of and the reports from different parts of the country indicated that the movement is progressing, and in my opinion it will continue to grow.

Dr. Wiley's work for pure food and drugs was endorsed after quite an animated discussion.

The report of the Committee on National Legislation was very satisfactory, the work accomplished proved the great amount of labor expended by the committee, particularly the chairman, Mr. W. S. Richardson of Washington, who is always ready and willing to labor for this cause.

The Committee on U. S. P. and N. F. propaganda gave an interesting report, stating that the use of U. S. P. and N. F. preparations in prescriptions had increased from twenty-five to fifty per cent., which to my mind is a very good showing.

The report of the Treasurer showed the largest balance in the history of the Organization.

The report of the Secretary, Mr. Thomas H. Potts, secured the endorsement of the association. Mr. Potts is a graduate of the Philadelphia College of Pharmacy, a man who has been greatly missed in the drug circles of Philadelphia, honored and respected throughout this country and one who is doing everything that lies in his power to benefit the retail druggists. His unanimous reelection to the Secretaryship shows that his devotion to and faithful performance of the duties pertaining to this office were fully appreciated.

The Procter Memorial Committee was given two hundred dollars in lieu of soliciting subscriptions from the members, which I think was a commendable plan.

The future of the association, I predict is a great one. I can see each year a marked improvement over the previous one. It appears to me that it is realized that the commercial side of our profession is a very important branch of it, and it is no doubt that it is the mission of the N. A. R. D. to develop and improve the commercial conditions of pharmacy, and I am satisfied that much is being accomplished.

The officers elected for the ensuing year are bright, active, and energetic men, and I have no fear but that they will render a satisfactory report at the coming convention of 1912.

In conclusion, let me say that I hope every retail druggist in the United States will realize the importance of becoming a member of this great organization.

ABSTRACTS OF STATE PHARMACEUTICAL ASSOCIATION PAPERS.

By John K. Thum,

Pharmacist at German Hospital, Philadelphia.

Variations in the Form of Digitalis Hairs.

By Henry Kraemer.

The author states that while much attention has been given to the pharmacognosy of digitalis, the studies have mostly been along lines to differentiate digitalis from other leaf drugs occasionally substituted for the real drug. The writer expresses the fact that the adulteration of this drug or its substitution is very rare. Although digitalis has been in use as a medicinal for some 400 years and many conflicting statements are still made regarding its efficiency and deterioration of its preparations we may well ask how much real progress has been made in the solution of the problems which this drug with its complex constituents offers. He then goes on to say that while it is true that there are methods for the biological standardization of this drug and its preparations, yet these do not enable us to determine in advance which lot of the drug will, in a given instance, be found valuable and which will be of inferior quality. No work on this important drug will be complete until we can determine either by chemical analysis or through pharmacognostical studies the differences between different samples of drug. While various pharmacopœias require that leaves only from second year plants shall be used, and at present there is a tendency to make it a requirement that the leaves shall be thoroughly dried and stored in containers with freshly burnt lime, yet recent investigations tend to show that the leaves of the second year plant are relatively but slightly more potent. And we know that certain practitioners use only the tincture made from the fresh drug. In spite of the fact that many pharmacopœias require that leaves only of the wild plants should be employed it is the practice of many discriminating pharmacists in the United States to employ the leaves of the cultivated plant.

Referring to the papers of Hartwich and Bohny on digitalis, he mentions that their observations show many variations in the structure of wild plants and those selected from cultivated varieties. That the leaves of wild digitalis are usually more hairy, that the cells of the hairs are shorter and broader and that the outer walls of the middle and lower cells of the non-glandular hairs are papilose. Vogl mentions the fact that the end cells are occasionally either finely striated or finely papilose. As a matter of fact the observations of both of these authors are correct. In regard to the number of cells making up these non-glandular hairs, Vogl states that they are mostly 3-celled, Hartwich and Bohny say that they are usually 2- to 4-celled and seldom 5- to 6-celled, and Greenwich records the fact that they may be as many as 10-celled long. While the author has not been able to confirm Greenwich's observation, he has seen specimens in which many hairs were 7 to 8 cells long, and believes that Greenwich's statement can be confirmed.

The author states that the hairs of many plants contain active principles; the nature of the secretory substances in the hairs of digitalis is unknown, yet in certain specimens we find a preponderance of glandular hairs and it may be that the minute study of these hairs will throw some light on the variation in the drug (Penn. Pharm. Assoc.).

IS FORMALDEHYDE PRODUCED UPON HEATING SUGAR?

By W. B. Meade.

The author subjected powdered sugar, contained in a flask, to heat ranging from 80° C. to 200° C., the outlet tube of the flask leading into a test tube, containing water. Three experiments were tried. None of the distillates gave the reaction for formaldehyde when treated with the Rimini, U. S. P. resorcinol and the HCl, iron peptone tests (Penn. Pharm. Assoc.).

THE PHARMACOGNOSY OF ECHINACEA.

By Henry Kraemer and Maud Sollenberger.

The authors state that although Echinacea augustifolia has been used in certain proprietary medicines for a number of years, it was not until 1886 that the identity of the drug was determined. They also state that while the drug is largely used, the Council on Pharmacy and Chemistry of the American Medical Association has investigated it and deem it unworthy of further consideration until more reliable evidence is presented in its favor.

The drug and plant have a number of interesting anatomical features and the results of their study by the authors were obtained from authentic specimens of the crude drug and cultivated living plants which have been growing for some time in the garden of the Philadelphia College of Pharmacy.

There are two species of *Echinacea* indigenous to the United States and known under the generic name of *Brauneria*.

The authors give a very minute description of this plant which they state is a perennial herb. In speaking of the microscopical structure they state that the outer portion of the rhizome and root consists of 2 to 4 layers of more or less tabular cork cells with somewhat thickened yellowish suberized walls, the cells being frequently filled with more or less spherical globules of a substance which may become changed to a granular form.

In their study of the intercellular substance they found that the oleoresinous canals or reservoirs are of the general type occurring in the Tubulifloræ. They are found in the wood and bark. The contents are light yellowish, amber-like in color and of an oily or resinous consistence (N. J. Pharm. Assoc.).

FLUIDEXTRACT OF ECHINACEA.

BY GEORGE M. BERINGER.

As it is proposed to introduce a formula for Fluidextract of Echinacea in the next revision of the N. F. the writer of this paper tried exhausting this drug with various strengths of alcohol and water. The best result in his judgment was obtained with a menstruum of alcohol 4 volumes and water 1 volume (N. J. Pharm. Assoc.).

DETECTION AND ESTIMATION OF TALC IN SOME FORMS OF CONFECTIONS.

BY CHARLES H. LAWALL.

The author gives a method for estimating the talc used by confectioners in coating candies. As the amount of talc is usually too small to permit of estimation by direct ignition, the author devised the following process which he states is convenient and trustworthy.

Two grammes of the sample are placed in a heavy beaker, covered with about 250 c.c. of distilled water and allowed to stand one minute. The liquid is poured off closely and this treatment repeated twice. With this class of confectionery the washing is always somewhat turbid, as some insoluble coating or polishing material is used, but when talc is present in the finely powdered foliated form the characteristic satiny lustre is easily perceived. The wash liquors are passed through an ashless filter, the filter dried, ignited and weighed. If talc has been used as a coating, the ash will range between 0.25 gm. and 0.40 gm. A microscopic examination is made of one portion of the ash, the remainder is fused with sodium carbonate and the SiO_2 and MgO estimated in the usual manner. A proportion of about 55 per cent. of SiO_2 and 35 per cent. of MgO should be obtained, confirming the presence of talc, which is a hydrated magnesium silicate (Penn. Pharm. Assoc.).

HEADACHE REMEDIALS.

BY PHILEMON E. HOMMELL.

The author goes over the list of drugs used in the treatment of headache before the introduction into medicine of the coal tar derivatives. He states that while the drugs mentioned did not relieve as readily as the synthetic remedies, yet there were few, if any, fatalities; this, he says, cannot be said of acetanilid or like products.

In order to obtain the gratifying results of acetanilid without its attendant disadvantage he recommends its exhibition in fluid form. More satisfactory results follow its combination with caffeine, nux vomica and aromatic spirits of ammonia.

He suggests the following formula:

ELIXIR ACETANILID COMPOUND.

Acetanilid	320 grs.
Caffeine	32 grs.
Tinct. Nux Vomica	256 minims.
Spts. Ammonia Aromatic	8 fluidounces.
Purified Talcum (U. S. P.)	120 grs.
Aromatic Elixir (U. S. P.)	to make 16 fluidounces.

(N. J. Pharm. Assoc.)

POWDERED BLAUD'S MASS.

BY GEORGE M. BERINGER, JR.

The author says that there is considerable demand for the time-honored "Blaud's Mass" in powdered form and as the manufacturers are listing such a preparation a formula for its manufacture should receive official recognition.

The formula which we give below he has used with success.

Exsiccated ferrous sulphate	105 gms.
Potassium carbonate	80 gms.
Powdered sugar	105 gms.
Powdered acacia	10 gms.

Rub the potassium carbonate with 10 c.c. of water and add the other ingredients, previously mixed. Rub till evenly colored. Dry in an oven and powder. Preserve in tightly stoppered bottles (N. J. Pharm. Assoc.).

THE N. F. PEPSIN PREPARATIONS.

BY PHILEMON E. HOMMELL.

The author enumerates the whole list of pepsin preparations contained in the present edition of the N. F. and states that they were introduced from time to time to replace those of a proprietary nature. Few of them are prescribed nowadays and from a therapeutic standpoint he believes it was foolish to have ever introduced so many pepsin preparations in the National Formulary, especially those containing more than 10 per cent. of alcohol, which always impairs the digestive properties of the pepsin. He then remarks that the employment of pepsin as a therapeutic agent has been greatly overestimated. Tons of it have been wasted and so has considerable money for its many useless preparations. He makes a plea that the N. F. limit the pepsin preparations (N. J. Pharm. Assoc.).

THE DETERMINATION OF CAMPHOR.[1]

By H. C. Fuller,
Assistant Chemist, Division of Drugs.

The extensive use of camphor in medicine and the fact that the Pharmacopœia includes preparations which must contain definite quantities of camphor make it imperative that there should be a reliable method of assay. There have been in vogue for some time procedures depending on the rotation of an alcoholic, benzol, or oil solution and on the loss by evaporation, but they are open to objection, and in certain instances the results might easily be misinterpreted. Artificial camphor is without rotatory power, natural camphor might contain a portion of the levo body, the rotation varies with the strength of the solvent, and fixed oils themselves on heating often undergo loss or gain in weight. These are a few of the reasons which call for a method based on a more substantial foundation.

Camphor, being of ketonic character, forms with hydroxylamin a well defined oxim $C_{10}H_{16}NOH$, and advantage has been taken of this property in assaying camphor preparations, the procedure being based on Walther's [2] carvone estimation and on the work of Nelson,[3] who determined in essential oils by the hydroxylamin method a number of keptones including camphor. The procedure is simple and may be applied directly to spirits of camphor. Of the sample 25 c.c. are measured into an Erlenmeyer flask of 100 c.c. capacity, 2 grams of sodium bicarbonate are added, and then, accurately, from a burette, 35 c.c. of a hydroxylamin solution (20 grams $NH_2OH.HCl$ + 30 c.c. H_2O + 125 c.c. absolute alcohol aldehyde free). The flask is connected with a reflux condenser, and heated to gentle boiling for two hours; it is then cooled to 25° C., treated with a mixture of 6 c.c. hydrochloric acid (1.12 specific gravity + 6 c.c. water), transferred to a 500 c.c. volumetric flask, rinsing out the condenser and flask with water, and finally made up to volume; 50 c.c. portions are filtered off and titrated as follows: Methyl orange is added and the mineral acid neutralized with normal alkali, then phenolphthalein is added and the hydroxylamin hydrochlorid titrated with tenth-normal alkali. A blank must be run using the same amount of hydroxylamin solution and 25 c.c. of alcohol to correspond with the spirits of camphor, the difference in titrations representing the hydroxylamin converted into camphor oxim. Each cubic centimeter of tenth-normal sodium hydroxid is equivalent to 0.01509 gram of camphor.

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[1] Circular No. 77, Bureau of Chemistry, U. S. Department of Agriculture.

[2] *Pharm. Centralhalle,* 1900, **41**; 613.

[3] U. S. Dept. Agr., Bureau of Chemistry Bul. 137, p. 186.

NEW ESSENTIAL OILS.[1]

Oil of Artemisia cærulescens, L.—Of this plant, which belongs to the N. O. Compositæ, and occurs on the littoral of the Mediterranean and, in parts, on that of the Atlantic, a sample has reached us from Turin under the name of *Erba Santa Maria.* We obtained from it 0.24 per cent. of an oil which, in its odor, showed a certain similarity to oil of hyssop, but at the same time reminded somewhat of ambrette. At room temperature it appeared as a brownish, butter-like mass, studded with white crystals, which only between 35 and 40° dissolved into a pale brown liquid. Its constants were determined as follows: d_{40° 0.9179, α_D — 5°50′, acid v. 11.3, ester v. 42.0, insoluble in 80 per cent. alcohol, soluble in any proportion in 90 per cent. alcohol, with separation of a solid substance. The crystals isolated from the oil, after being recrystallised from alcohol, formed fine, white odorless needles, m. p. 108°; so far their chemical characteristics have not been further investigated.

Cardamom Root Oil.—From cardamom-roots from Indo-China we have obtained a yield of 0.64 per cent. of a lemon-yellow oil possessing a peculiar, aromatic odor, which bears no resemblance to that of the oil from seed. So far our attempts to ascertain the parent-plant of the oil have been unsuccessful. The oil gave the following constants: $d_{15°}$ 0.9066, α_D —32° 57′, $n_{D20°}$ 1.48151, acid v. 3.7, ester v. 87.9, ester v. after acetylation 96.7. The oil was soluble in 0.5 vols. 95 per cent. alcohol; when more alcohol was added the mixture rapidly turned turbid, and did not become clear again until the solvent had been increased to 4 vols. Fractional distillation under diminished pressure (5 mm.) gave the following result:

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[1] From Semi-Annual Report, Schimmel & Co., October, 1911, p. 104–109.

1.	to 35°	— 5.4%	α_D — 0° 10′
2.	35 " 40°	— 8.7%	α_D — 0° 32′
3.	40 " 100°	— 5.4%	α_D —17° 5′
4.	100 " 110°	—10.6%	α_D —31° 10′
5.	110 " 115°	—44.2%	α_D —45°
6.	115 " 145°	— 6.4%	α_D —33° 14′
7.	residue	19.3%	α_D —39° 15′

Fractions 1 and 2 contained cineol, which was identified from the double-compound it gave with resorcinol. From fractions 4 and 5, a portion boiling between 117 and 120° (5 mm.) was separated by repeated fractionation. Saturated with hydrochloric acid gas in dry ethereal solution at — 18°, this fraction yielded a hydrogen chloride compound which, when recrystallised from methyl alcohol had m. p. 79 to 80°. The hydrochloride was inactive; the chlorine-determination gave the following result:

0.4306 subst.: 0.5928 g. AgCl

	Found	Calc. for $C_{15}H_{24}$, 3HCl.
Cl	34.06%	33.9%

Our surmise that we had here before us the hydrochloride of bisabolene was confirmed by further examination. With sodium acetate and glacial acetic acid a sesquiterpene was eliminated from it which, when twice fractionated, was found to possess the following constants: 265 to 267° (757 mm.), $d_{15°}$ 0.8748, α_D + 0°, $n_{D20°}$ 1.49063. With hydrochloric acid this hydrocarbon yielded again the trihydrochloride melting between 79 and 80°.

The residue of distillation of cardamom-root oil solidified at about 15° with separation of paraffin; the last-named body, when recrystallised from alcohol, melted at 62 to 63°.

This examination shows the presence in cardamom-root oil of cineol, bisabolene and a paraffin; bisabolene being the principal constituent.

Cedarwood Oil, East African.—The wood of the red cedar (*Juniperus virginiana,* L.) which comes from Florida and is used in the manufacture of lead-pencils, is becoming more and more scarce, but up to the present no other wood has been found capable of replacing it, which is all the more regrettable because in all probability there does not exist another industry so wholly dependent upon a single kind of wood. Recently, however, large forests of a cedar-species which affords a wood apparently very suitable for pencil-making, have been discovered in German East Africa.

A short time ago we were enabled to distil a large parcel of the wood of this East African cedar. Dr. Giessler informed us that the wood was derived from *Juniperus procera,* Hochst., a tree which occurs in the mountains of Abyssinia and Usambara, as well as on the slopes of the Kilimanjaro and the Kenia. The tree grows at altitudes of from 4500 to 9000 feet and in Usambara it forms extensive forests. In its anatomical structure the wood bears a great resemblance to that of *Juniperus virginiana.*

Shavings and short planks constituted our raw material. The former yielded by distillation 3.2 per cent. of a deep-yellow, liquid oil with an odor distinctly resembling that of vetiver, and giving the following constants: d_{15° 0.9876, n_{D20° 1.50893, acid v. 14.9, ester v. 8.4, ester v. after acetyl. 70. The oil itself being too dark to permit the reading of its opt. rot., this constant was determined from a solution of equal volumes of oil and alcohol, and found to be — 3° 43′, in a 2 cm.-tube, which would correspond with a rotation of — 37° 10′ in a 100 mm.-tube for the original oil. The oil was soluble in 1.6 vols. a. m. 80 per cent. alcohol and in one half its own vol. a. m. of 90 per cent. alcohol.

The short planks, after being broken up, yielded about 3.24 per cent. of an oil which formed at ordinary temperature a semi-solid mass studded with crystals. When drained off from the crystals the oil gave the following constants: d_{15° 1.0289, n_{D20° 1.51011, acid v. 27.06, ester v. 7.93, ester v. after acetyl. 89.6. In this case also it was impossible to ascertain the rotation of the original oil; but when diluted with its own volume of alcohol, it gave — 3° 15′ in a 20 mm.-tube, equal to 32° 30′ in a 100 mm.-tube for the original oil. The oil was soluble in 2 vols. a. m. 80 per cent. and in one-half its own vol. 90 per cent. alcohol. The crystals consisted of cedar camphor. Recrystallised from alcohol they melted at 86 to 87°, sp. rot. + 10.12° (2.5517 g. substance dissolved in 25 cc. chloroform). The phenylurethane melted at 106.5°.

Oil of Cinnamomum Burmanni.—Two lots of cinnamon bark which had been sent to us from the islands of Celebes and Timor, their respective producing districts, when anatomically examined by Dr. Giessler proved to be identical, the parent-plant of both, according to this authority, being *Cinnamomum Burmanni,* Blume (*C. Kiamis,* Nees), N. O. Lauraceæ.

Distillation yielded us 0.5 per cent. of a brownish-yellow oil with an aroma resembling that of Ceylon cinnamon oil, but less delicate. The constants of the oil also differed from those of Ceylon cinnamon oil, being: d_{15° 1.0198, α_D − 1° 50′, n_{D20° 1.58282, soluble in 0.8 vols. 80 per cent. alcohol and more; giving no clear solution with 10 vols. 70 per cent. alcohol. The cinnamic aldehyde content, as determined with neutral sodium sulphite, was 77 per cent., while a determination with bisulphite showed about 80 per cent., but in the latter case the result was very untrustworthy, probably owing to the fact that other aldehydes were also present, and that their bisulphite-compounds separated out from the solution and prevented an accurate reading. The determination of phenols with 3 per cent. soda liquor gave a phenol-content of about 11 per cent. Unfortunately part of the oil had become emulsified during the shaking with the soda liquor, hence it was impossible to read off accurately those parts of the oil which had not entered into reaction. The value given above is therefore only approximate.

Oil of Matricaria discoidea.—Among the numerous plants of the N. O. Compositæ which have been introduced among us from North America is *Matricaria discoidea,* D. C., a plant resembling our chamomile, but smaller and also particularly differing from our chamomile in having much smaller marginal flowers. The plant was introduced into Europe in the middle of the nineteenth century and has acclimatised itself with surprising rapidity; being, for instance, very common in Württemburg and in many parts of Alsace-Lorraine, in particular in the neighborhood of railway-stations.[1] We have also observed this chamomile in Leipzig and its vicinity (Railway Station to Berlin, Gohlis, Eutritzsch, Rosental, Schönefeld, Zwenkau, and Miltitz), and have caused a small quantity of it to be collected locally for distilling purposes. From the entire plant, every part of which appears to contain essential oil, we obtained 0.15 per cent. of a dark brown oil, studded with paraffin crystals when at ordinary temperature, possessing an odor which may be said to be intermediate between that of common and of Roman chamomile oil. Sp. gr. at 30° 0.9175, acid v. 18.7, ester v. 77.5. On account of its fairly considerable paraffin-content the oil made no clear solution even with 90 per cent. alcohol. The paraffin which was separated out, after being twice recrystallised from dilute alcohol, melted between 58 and 61°.

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[1] According to a symposium in the *Pharmakognostische Rundschau* for the year 1910 (published by Mitlacner, Tunmann and Winckel), Vienna 1911, p. 85.

Oil of Meriandra benghalensis.—In the course of the present year we received from the Government of the Italian colony of Eritrea two essential oils prepared in that colony, and described as sage oils. The samples were of a pale-brown color and possessed an odor which, although it bore some resemblance to that of sage oil, was nevertheless clearly different. Moreover, the sp. gr. of the two samples was higher than that of sage oil; and they also differed from that oil in being lævorotatory. At our request a sample of the distilling-material had been forwarded with the second oil-sample, and we were therefore in a position to have the raw material botanically examined. Dr. Giessler ascertained that the plant from which the oil was distilled does not belong to the genus *Salvia* at all, but is, in fact, *Meriandra benghalensis*, Benth.; N. O. Labiatæ (recently re-named *M. dianthera*, Briq.), the leaves of which, as a popular remedy, are used for similar purposes as those of sage. Upon distilling the raw material it yielded us 1.5 per cent. of a pale brown oil, with an odor reminding both of sage and rosemary. Further examination produced the following results: $d_{15°}$ 0.9513, α_D — 2° 5′, $n_{D20°}$ 1.47490, acid v. 3.7, ester v. 14.8, soluble in 2 vols. and more of 70 per cent. alcohol. When placed in a freezing mixture the oil solidified to a butter-like consistency as a result of the separation of camphor.

The two oils distilled in Eritrea behaved as follows:

1. $d_{15°}$ 0.9464, α_D—0° 30′, n_{D20} 1.47176, acid v. 1.0, ester v. 11.8, sol. in 2 vols. a. m. 70% alcohol.
2. $d_{15°}$ 0.9526, α_D—1°, $n_{D20°}$ 1.47548, acid v. 5.6, ester v. 9.3, sol. in 1.8 vols. a. m. 70% alcohol.

Neither sample possessed its full camphor-content, for in the preparation of No. 1 part of the camphor had separated out during distillation in the condensing worm, while from No. 2 it had been partly extracted by freezing-out. In both cases, samples of the separated camphor had been sent to us from Eritrea, and the substance was identified more closely from its m. p. (176°), and its oxime (m. p. 118.5°). Optical examination showed it to consist of the dextrorotatory modification.

Santolina Oil.—Santolina Chamæcyparissus, L., N. O. Compositæ, is a native of Southern Europe, and is much cultivated as a garden-plant. It is distinguished by its powerful, penetratingly aromatic odor. Formerly it was official on account of its therapeutic properties, among others as an antispasmodic and anthelmintic, and to this day it is used as a popular remedy throughout its native region. A sample of the herb received from Turin has been worked up by us for essential oil, of which it yielded 0.47 per cent. The oil was of a dark-brown color and in its odor reminded somewhat of wormwood, or rather of tansy. $d_{15°}$ 0.9065; $n_{D20°}$ 1.50040; acid v. 6.6; ester v. 16.4; ester v. after acetyl. 74.2; opt. rot. impossible to determine on account of the dark color. The oil was soluble in 0.5 vols. a. m. 90 per cent. alcohol, with elimination of paraffin; insoluble in 80 per cent. alcohol. So far no further particulars of its composition have been ascertained, but judging from the odor, thujone appears to be one of the constituents.

Santolina oil has also been mentioned recently in a French periodical,[1] but no particulars of its properties are given there, all that is stated being that the oil has an odor reminding of ambrette and closely resembling that of muscatel sage oil. We cannot say the same of the oil distilled by us.

Oil of Saturcja cuncifolia.—We are indebted to Dr. Giaconi, of Trieste, for four samples, distilled by himself in Dalmatia, of oil of *Saturcja cuncifolia*, Tenore, N. O. Labiatæ. The oils were of a brownish-yellow color and possessed an odor reminding of thyme; their other characteristics were as follows:

	$d_{15°}$	α_D	n_{D2}	Phenols	Soluble in
1.	0.9182	—4° 45′	1.49816	28%	1.2 vol. a. m. 80% alc.
2.	0.9190	—5° 15′	1.49824	34%	1.1 vol. a. m. 80% alc.
3.	0.9444	—2° 15′	1.50528	59%	2.5 vol. a. m. 70% alc.
4.	0.9440	—1° 50′	1.50556	59%	2.7 vol. a. m. 70% alc.

[1] Parfum. moderne 4 (1911), 97.

Samples Nos. 1 and 2 were insoluble in 10 vols. 70 per cent. alcohol, Nos. 3 and 4 were soluble in about their own vol. of 80 per cent. alcohol. The phenols consisted of carvacrol, the non-phenols had a pronounced odor of cymene, but the samples at our disposal were too small to prove the presence of that body.

OBITUARIES.

American pharmacy has recently lost through death three of her most eminent followers, each being distinguished in a separate department of the work.

Dr. Walter Wyman, Surgeon-General of the United States Public Health and Marine-Hospital Service, was the exponent of the scientific trend in pharmacy and whose valuable work in connection with the revision of the U. S. Pharmacopœia is becoming quite well known to the pharmacists of the United States, died on November 21, 1911. A brief sketch of his exemplary career is given on page 1 of this issue.

Mr. Charles E. Dohme, president of the well known manufacturing house of Sharp and Dohme, died on December 7th at his home in Baltimore. The record of his life is an inspiration to those who are embarking in the profession of pharmacy. He was born in Germany on March 12, 1843; came to the United States at the age of 8; served an apprenticeship in the drug store of Alpheus P. Sharp in Baltimore; graduated from the Maryland College of Pharmacy; entered the employ of the house of Sharp and Dohme; later becoming a member of the firm and finally president of the incorporated house.

Mr. Dohme also found time to devote himself to the advancement of very many other phases of pharmacy. He was president of the Maryland College of Pharmacy, president of the Maryland Pharmaceutical Association and later became president of the American Pharmaceutical Association. He was at one time chairman of the Board of Trustees of the U. S. Pharmacopœial Convention and did much to encourage the publication of the Spanish translation of the U. S. Pharmacopœia. While very active with his business affairs, yet he did not forget to live in the true sense of the word. He was fond of literature and music and in later years travelled extensively. He was interested in the development of the City of Baltimore, and contributed of his time and means to further its growth. At conventions it was delightful to be with him. He was well posted on nearly all of the subjects of the day as well as those relating to pharmacy. His judgment was excellent, his manner modest and his optimism made for him many friends who revere his memory.

He is survived by his widow and four children—Dr. A. R. L. Dohme, of Sharp & Dohme; Miss Adele Dohme, Mrs. Hans von Marees, of Baltimore, and Mrs. Charles E. Holtzhauer, of Newark, N. J.

Dr. William Muir, one of the most prominent retail pharmacists in the United States, died on November 24, 1911. He was recognized as a leader among the retail pharmacists and was personally known by nearly all of them. Dr. Muir was born in Glasgow, Scotland, in 1850 and came when a mere lad to the United States. He graduated from the College of Pharmacy of the City of New York in 1870. For nearly fifteen years he clerked for some of the most influential pharmacists of Brooklyn. In 1884 he went into business for himself at Bedford Avenue and South Second Street, Brooklyn, and continued here for nearly fifteen years, when he sold his share, retiring with a competence.

Dr. Muir was a charter member of the National Association of Retail Druggists and worked most indefatigably in the interests of the members of that organization. While Dr. Muir was well known for his work in the Kings County Pharmaceutical Society, the New York State Pharmaceutical Association, and the New York State Board of Pharmacy, it is quite likely that his most enduring work was in connection with the N.A.R.D. He was a forceful speaker and ever ready to defend the rights and interests of the retail pharmacists. Dr. Muir was not a theorist and usually labored with those problems in organization work that could be accomplished at the time. Dr. Muir was a member of the Special Committee of the New York State Pharmaceutical Association on the Procter Monument Fund, and it was largely through his efforts that over $200 was collected (see Proc. A. Ph. A., 1907, p. 98).

Dr. Muir was prepossessing in appearance and being of a generous and cordial disposition made many friends in the organizations of which he was a member.

THE AMERICAN
JOURNAL OF PHARMACY

FEBRUARY, 1912

THE ALKALOIDAL ASSAY OF CALABAR BEANS.

By Arthur Henry Salway, D.Sc., Ph.D.

In connection with a recent chemical examination of Calabar beans (*Jour. Chem. Soc.*, 1911, **99**, 2148), the amount of total alkaloid was first determined according to the method of the U. S. Pharmacopœia. It was found, however, when working on a large scale, that the amount of alkaloid isolated, was considerably greater than that indicated by the preliminary assay of the beans. It was therefore deemed desirable to conduct a few experiments in order to determine the cause of this discrepancy.

The calabar beans employed in these experiments yielded, when working on the large scale, an amount of alkaloid equivalent to 0.179 per cent. of their weight, whereas an assay conducted according to the method of the U. S. Pharmacopœia indicated the presence of only 0.091 per cent.

The principal alkaloid of calabar beans, physostigmine, is slightly phenolic in character and consequently not easily extracted from a solution that has been rendered alkaline. It seemed, therefore, that the three successive extractions with 25, 20 and 15 c.c. of ether respectively, as indicated by the pharmacopœia, were not sufficient for the complete removal of the alkaloid. In order to test this supposition an experiment was conducted in which the alkaline liquid obtained according to the directions of the pharmacopœia was shaken with successive portions of 20 c.c. of ether. At the conclusion of every third shaking the ethereal extracts were united, washed with 2 c.c. of distilled water,[1] and the amount of alkaloid determined by titration in the usual manner, when the following results were obtained:

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[1] The Pharmacopœia does not recommend the washing of the ethereal extract. This omission allows traces of sodium bicarbonate to be introduced into the liquids to be subsequently titrated, thus giving a result somewhat higher than would otherwise be obtained.

3 extractions with ether removed 0.093 per cent. of alkaloid.
6 extractions with ether removed 0.137 per cent. of alkaloid.
9 extractions with ether removed 0.159 per cent. of alkaloid.
12 extractions with ether removed 0.165 per cent. of alkaloid.

It will be seen from the above figures that little more than half of the total alkaloid present was removed by three extractions with ether. On the other hand the results show, that, after 12 successive shakings with 20 c.c. each of ether, practically all the alkaloid had been extracted.

It next seemed of interest to ascertain whether the extraction of the alkaloids could be facilitated by the use of sodium carbonate instead of the bicarbonate. With this object in view the acid solution of the alkaloids, which had been obtained according to the directions of the pharmacopœia, was rendered alkaline with 10 c.c. of an aqueous solution of sodium carbonate (1 in 10), and then extracted with successive portions of 20 c.c. of ether. At the end of every third extraction the ethereal liquids were united, washed with 2 c.c. of water, and the alkaloid estimated in the usual manner.

3 extractions with ether removed 0.126 per cent. of alkaloid.
6 extractions with ether removed 0.157 per cent. of alkaloid.
9 extractions with ether removed 0.165 per cent. of alkaloid.
12 extractions with ether removed 0.168 per cent. of alkaloid.

On comparing these results with those previously obtained it is evident that there is some advantage in the use of sodium carbonate, since in this case 9 successive extractions with 20 c.c. each of ether are sufficient to remove practically the whole of the alkaloid.

As a result of the above experiments the author recommends the following modification of the official method for the assay of alkaloids in calabar beans:

Twenty grams of powdered calabar beans (No. 60 powder) are well agitated with 200 c.c. of ether, then 10 c.c. of an aqueous solution of sodium carbonate (1 in 10) added, and the mixture shaken vigorously at intervals for 4 hours. The powder is allowed to settle, after which 100 c.c. of the ethereal liquid are transferred to a separator, and sufficient decinormal sulphuric acid added to render it distinctly acid. The liquid is then well shaken and the acid layer drawn off, this operation being repeated twice, using each time 10 c.c. of decinormal sulphuric acid. The acid extracts are then combined, sufficient sodium carbonate solution (1 in 10) added to render the liquid alkaline, and the mixture subsequently shaken 10 times successively with 20 c.c. of ether. The combined ethereal extracts are next washed with 5 c.c. of distilled water and the ether removed. The residue is finally dissolved in 5 c.c. of decinormal sulphuric acid, and the excess of acid titrated with $\frac{N}{50}$ alkali, using iodeosin as indicator.

THE WELLCOME CHEMICAL RESEARCH LABORATORIES,
London, E. C.

A NOTE ON THE POISONOUS PROPERTIES OF PARTHENOCISSUS QUINQUEFOLIA.*

By L. E. Warren.

The death of a child after eating the berries of the Virginia creeper was recently recorded by the public press in Oregon.[1] It appears that the child was taken violently ill without any assignable cause and died after a short time. An examination of the patient's vomitus showed that it contained a large quantity of the disintegrated berries from this plant from which it was concluded that the fruit was the probable cause of illness. The press report states that the city milk chemist (of Portland) then fed a dozen of the fresh berries to a healthy guinea pig with the result that the animal died in 36 hours.

The Virginia creeper, *Parthenocissus quinquefolia* (L.) Planchon is better known as *Ampelopsis quinquefolia* Michaux. At various times it has been called *Ampelopsis hederacea* De Candolle, *Hederacea quinquefolia* Linné, *Vitis hederacea* Wildenow, *Vitis quinquefolia* Lamarck, and *Cissus quinquefolia* Persoon. Some of its local appellations are American ivy, American woodbine, false grape, five-leaved ivy and wild wood-vine. It is a woody climber very abundant in North America. Its varieties are commonly cultivated for decorative purposes, the autumn foliage being very beautiful.

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* Read before the Section of Biological Chemistry of the American Chemical Society at the meeting held in Washington, D. C., December 27-30, 1911.

The leading writers on toxicology do not mention the Virginia creeper and apparently it is not generally considered toxic by authorities on poisonous plants since it is not listed in the publications of Cornevin,[2] Chestnut,[3] Esser,[4] Kanngiesser,[5] Schaffner,[6] Smith,[7] or Walsh.[8] However, Pammel and Fogel[9] in their list of the poisonous plants of Iowa say of it:

> "The fruit is looked upon with suspicion by some people, but there are no records of poisoning, so far as we know."

In a later work Pammel[10] says:

> "This plant is regarded as poisonous by some. The leaves and fruit abound in raphides."

While neither botanists nor toxicologists consider the plant toxic, there have been a few cases of poisoning attributed to it. Thus Bernays[11] records the serious illness of two children from swallowing the juice from the chewed leaves. The symptoms were violent vomiting and purging, tenesmus followed by collapse and stupor for two hours after which another period of vomiting and purging occurred.

Gorup-Besanez[12] examined the fruit of this plant nearly forty years ago and found large quantities of oxalic acid. A recent analysis by Poyneer and Duffin[13] has confirmed this fact. Holm[14] has recently shown the presence of calcium oxalate crystals in many parts of the plant, although the fruit is not mentioned in this connection. Whether or not oxalic acid exists in the fruit in the free state the presence of calcium oxalate in the form of raphides would render the fruit poisonous, both from the irritating mechanical effect of the crystals and from the solubility of the substance in the gastric juice. The presence of alkaloids, glucosides, saponins or toxalbumins has not been demonstrated.

As oxalic acid is dangerously toxic (60 grains having caused the death of a human being[15]) it is quite possible that this constituent of the fruit was responsible for the death earlier recorded in this note. By correspondence with the physicians interested in the case mentioned an attempt was made to get further information concerning the symptoms of the patient, especially with reference to their similarity to the indications of oxalic acid poisoning, but the evidence obtained was not sufficient to warrant any conclusions.

Pending further investigations the attention of gardeners, householders and physicians is called to the suspicious character of the Virginia creeper.

BIBLIOGRAPHY.

[1] *Ore. Dai. Jour.,* **10**, No. 195, p. 24 (1911).

[2] Cornevin: Des plantes vénéneuses et des empoisonnements qui elles determinent, (1893).

[3] Chestnut: U. S. Dept. of Ag., Bull. **86**, (1898) (Thirty Pois. plants, U. S.); U. S. Dept. of Ag., Div. Bot., Bull. **20**, (1898) (Princ. Pois. Plants, U. S.).

—— and Wilcox: U. S. Dept. of Ag., Div. Bot., Bull. **26**, (1901) (Stock Pois. Plants Mont.).

[4] Esser: Die Giftpflanzen Deutschlands (1910).

[5] Kanngiesser: Vergiftungen Pflanz. Pflanzenstoffe (1910).

[6] Schaffner: *Ohio Naturalist,* **4**, 16, 32 and 56 (1903–4) (Pois. Inj. Plants Ohio).

[7] Smith: Pois. ·Plants (1905).

[8] Walsh: So. Af. Pois. Plants (1909).

[9] Pammel and Fogel: *Proc., Iowa Acad. Sci.,* **14**, 164 (1907) (Pois. Plants Iowa)..

[10] Pammel: Man. Pois. Plants, 124 (1910).

[11] Bernays: *Brit. Med. Jour.,* ii, 32 (1876); *Lancet,* ii, **26**. (1876).

[12] Gorup-Besanez: *Neues Repert. Pharm.,* **23**. 180. (1874).

[13] Poyneer and Duffin: *Chem. News,* **99**. 99. (1909).

[14] Holm: Merck's Rep., **20**, 309. (1911).

[15] Barker: *Assn. Med. Jour.,* ii, 1073. (1855).

Wittstein: *Repert. Pharm.,* [2], **46**, 317. (1845).

Analysis of green leaves (*Ampelopsis hederacea*). Found tartaric acid, gum and a substance which gave a green color with ferric chloride.

H. G. L.: *Drug. Circ.,* **3**, 198, (1859).

States that the berries of *Ampelopsis quinquefolia* contain malic acid.

Gorup-Besanez: *Ber. Chem. Gesell.,* **4**, 905. (1871).
Annal. Chem. Pharm., **161**, 225. (1872).
Neues. Repert. Pharm., **21**, 109. (1872).

Leaves of *Ampelopsis hederacea* gathered in midsummer contained albumen, pyrocatechin, sugar, free tartaric acid, potassium bitartrate and calcium tartrate. Leaves collected in September contained neither tartaric acid nor potassium bitartrate but pectin and calcium glycolate were present.

Phipson: *Chem. News,* **52**, 65. (1875).

Reports finding citric, tartaric, "viridic" and "cafetannic" acids in the green leaves of *Cissus quinquefolia.*

EUROPEAN REQUIREMENTS FOR ADMISSION TO THE PRACTICE OF PHARMACOLOGY AS EXEMPLIFIED IN GERMANY.

By H. L. Taylor, Ph.D.,

During the year the *Midland Druggist and Pharmaceutical Review* published a series of papers on the *Practice of Pharmacology in Europe.* The countries included in the study were Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, and Slavonia, Denmark, England and Wales, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Montenegro, The Netherlands, Norway, Portugal, Roumania, Russia, Scotland, Servia, Spain, Sweden, Switzerland and Turkey. The entire series of papers is reprinted in convenient form for reference.

This paper will have slight reference to the study, but it has the same purpose,—"to glean from the experiences of Europe factors involving the practice of pharmacology for the solution of similar problems."

The greatest of recent German educational writers in his book entitled "The German University," published in 1908, says:

"Making due allowance . . . one might describe the general character of the three great epochs of European civilization, as revealed in the progress of education, by saying that, in ancient times, the individual was educated for the State, in the Middle Ages for the Church, and in modern times for himself."

American civilization revealed in the progress of education combines these three characteristics of the three great epochs of European civilization. I invite your contemplation of the task imposed by American civilization—the equitable adjustment of the relations between the individual, the profession and the State. In ancient times the goal of education was to render the rising generations fit to serve the State efficiently in peace and in war and thus to maintain its permanence. This is fundamental in American education. That a government by the people could endure only when the people are enlightened was sufficient reason for creating the common school, and compelling attendance thereon.

In the Middle Ages the goal of education could be no other than to draw the rising generation within the circle of religious influences provided by the Church. Service in the Church was the only profession recognized by State and people. Hence education must conform to the requirements of the profession. To-day, the profession may not be lost sight of in educational policies.

In modern times, the State has risen superior to the profession and the conflict between these two great forces has made it possible for the individual to lay the foundation of a more independent existence. Hence, to educate man as a reasonable being, free to determine his own life, has become a dominant factor in American education.

First Epoch.—There were two great epochs of German civilization which produced modern German conditions. Let us glance at the first period, from the 6th to the 12th century. In 789 the King made it a general rule that schools should be attached to all convents and chapters in which boys were to be taught the plain chant of the Church, reading, singing, the Christian calendar and the Latin language. Some pressure was exerted by regulation to require the passing of an examination for admission to priests' orders. For admission to their profession candidates had to show that they knew and understood all the sacred books, that they could sing the plain chant and that they were able to compose documents and letters in Latin. The King also aimed to raise the level of the general education of the people, but this does not suggest modern ideas of primary schools with compulsory attendance. It would have been alike impossible and useless to teach Frankish warriors or peasants reading and writing. What really was attempted was instruction in the rudiments of the Christian faith. The pupils had to repeat the teacher's words until they knew them by heart; the teacher heard and explained what they had learned. By repeated edicts men, women and children were enjoined to know at least the Creed and the Lord's Prayer. The penalty of neglect or refusal imposed on both sexes was flogging or fasting. But it was found impracticable to compel the memorizing of the Creed and the Lord's Prayer.

This picture of general education would be incomplete were no sidelight turned on the professional requirements. The apprentice must be taught reading and singing and other boys should be admitted to such instruction without further remuneration than voluntary presents.

In the curriculum of these professional schools, three natural stages may be distinguished—the elementary, the middle and the higher. The first step began with the learning of the alphabet by rote; reading followed, which was of course in Latin; then came writing, practised on wax tablets, and side by side with such exercises singing was practised every day.

The second step comprised the preliminary studies of a general character arranged in two parts—the Trivium and the Quadrivium. The former included grammar, rhetoric and dialectics; the latter arithmetic, geometry, music, and astronomy. Grammar, of course, meant Latin. Geometry was what its title then covered—the knowledge that existed concerning the earth and the situation of the various countries. All these secular sciences, however, were subservient to the third stage—the professional. It may be added that the female sex was not altogether excluded from this education. Convent life made it accessible to them and learned nuns were by no means a rarity.

Second Epoch.—We now turn to the second epoch of Germany's development from the 12th century on. The scope of instruction was, in all its main outlines, determined by tradition. The method in all school faculties alike consisted in lectures and disputations. The purpose of the lectures was not, as at present, the systematic presentation of a science nor the dictation of a text, but the interpretation of a text-book which was in the hands of the students.

The progressive course of studies through which the students had to go within each faculty was settled in all details, step by step. On passing the first examination they attained the first degrees and the dignity—Baccalaureus. A second examination opened the door for the highest dignity—the grade of master or teacher; Magister remained the ordinary title in the lower, while Doctor became usual in the upper faculties. It should not be forgotten that all these examinations were of a purely academic and unofficial character.

The course of study was somewhat as follows: The boy passed the curriculum of á monastery, college or city-school, in which the elementary arts and the Latin language formed the principal subjects of instruction. At about 15 years he betook himself to a university and after many trying rites of initiation took the oath and was enrolled as a member of the corporation. Not unfrequently boys were admitted to a university at a much earlier age. The elementary instruction was provided for in the Pedagogium—a boarding school attached to the university. Under-graduates were placed under the Masters of Art and lived in the Collegium, a building belonging to the university, or in a Bursa, a private establishment carried on by the Master under the supervision of the university.

The great masses of students never went further in their studies than the faculty of arts and indeed the majority left the university without attaining any degree—even the baccalaureate.

In these restricted references to the two great epochs of German education are found the great principles of the modern German educational system. I must not take time to comment on them other than to say that during the thousand years of their development, similar social and economic conditions prevailed that are found in America. I refer you to the introduction of the study under the caption *Migrations* and quote from the *Whirlpool of Europe:*

> "It is of the greatest interest to trace in the history of nearly a thousand years ago the same problems that are exercising men's minds to-day and to realize how narrow in reality is the scope of human experience, so that we must go on fighting the same battles over and over again."

With this sketch of the rise of general education in Germany before us, let us turn to the present requirements for admission to the practice of pharmacology in that country. These requirements are typical and are a golden mean between those of Austria, Norway and Finland on the one hand, and England, Ireland and Scotland on the other.

EUROPEAN REQUIREMENTS FOR ADMISSION TO THE PRACTICE OF PHARMACOLOGY AS EXEMPLIFIED IN GERMANY.

Primary education is compulsory and free between the ages of six and fourteen. It is maintained by local taxation with State grants. The elementary courses are from four to six years in length. There are continuation schools and in the cities intermediate schools of differing grades.

Secondary education is given in gymnasia and real-schools or a combination of both. In Prussia this is a nine-year course based on a three-year foreschule. In other portions of Germany it may be somewhat shorter. The gymnasia afford classical instruction, which in the real-gymnasia is confined to Latin, while the real-schools make a feature of modern languages. The completion of the eight classes of the gymnasia and real-schools of Germany, Austria and other countries following the German system is a fair equivalent of New York's four-year stronger high school courses after the eight years of the elementary.

Higher.—There are 21 state universities scattered throughout the Empire available for students of higher educational qualifications.

Schools of pharmacy in the sense in which we use that term do not exist in Germany. Where a prescribed course exists it has no official meaning and no pharmacist is bound to take such course. The pharmacist, like every other student in a German university, has the privilege of electing whatever lectures he wishes and deems necessary, and attendance on all or none.

All the universities and some technical universities afford instruction in pharmacy with either proper pharmaceutical institutes or special pharmaceutical sections of chemical institutes available. The courses of study in typical German universities afford abundant material for study by the executive officers of the schools of pharmacy in America.

Administration.—The typical administration comprises the general control by the Minister of Public Instruction over all educational establishments, public or private, save the special schools dependent on other ministries. There is a provincial organization charged with the management of public elementary schools and special provincial boards charged with the management of secondary and normal schools.

Licenses.—Turning to the requirements in pharmacy, we find that a step upward from the decree of 1875 was made in October, 1904, which required a university course of at least four semesters instead of three. Central boards of those states that have one or more universities within their borders confer licenses in pharmacy, valid for the German realm. Lists of the licenses must be transmitted by each board to the Chancellor of the realm and must be published in Imperial and Provincial organs.

Examinations.—Preliminary and professional pharmaceutical examinations are required. Apprenticeship and assistantship are prescribed.

Preliminary.—For admission to the preliminary pharmaceutical examinations or for university study in pharmacy the scholastic requirement is a certificate of fitness for prima of the gymnasium or of a higher real-school, with supplementary proof of a knowledge of Latin. The apprentice requirement is evidence of employment for three years with a licensed pharmacist, which becomes two years for holders of the maturity certificate from a nine-class gymnasium. This preliminary examination is in charge of a commission comprising a medical officer as president, and two pharmacists, one of whom must be an active proprietor of a pharmacy at the seat of a commission. This commission holds office for three years. Examinations are held four times each year and are designed to test the apprentice's knowledge and capabilities for the duties of pharmacist's assistant. Proof is required of the requisite scholastic training or instruction by a pharmacist and a student notebook describing briefly the pharmaceutical tasks performed by the apprentice. The examination includes written, practical and oral tests. The written examination, conducted under strict supervision, includes an exercise in pharmaceutical chemistry, another in botany or pharmacology and a third in physics.

The practical test requires the apprentice to read, prepare and estimate prescriptions in varied forms; to make galenical preparations of the Pharmacopœia; to test chemical preparations as to their purity. The oral examination requires the apprentice to analyze fresh and dried plants; to recognize drugs and pharmaceutical chemical preparations; to answer questions from fundamental principles of pharmaceutical science—botany, chemistry and physics, and to present an herbarium prepared during apprenticeship.

An official register of the examination is preserved and a certificate is given to the successful candidate. Failure extends the apprenticeship from three to six months; a second failure bars from further examinations.

Professional.—For admission to the professional examination three items are essential: First, evidence that the preliminary examination has been passed; second, evidence of one year's employment as assistant in a German pharmacy, subsequent to the preliminary examination and prior to university study; third, evidence of four semesters of professional study at a university which must include the prescribed subjects. For example, in 1904 the prescribed subjects were:

Two semesters each of practical analytical chemistry and laboratory practice in pharmaceutical chemistry;

One semester each of microscopical examination of drugs and vegetable powders;

Familiarity with the methods of sterilization,

all of which are attested by the proper university instructor.

The state examination follows which must be passed before a pharmaceutical examining commission, organized at a university, and holding examinations twice each year. The commission, formed annually, comprises a teacher each of botany, chemistry, physics and pharmacy, and one or two pharmacists. The examination includes written, practical and oral tests. Only candidates that have passed the written may be admitted to the practical, and only those that have passed both may be admitted to the oral. The practical examination is divided into analytical chemical and pharmaceutical chemical divisions; the oral, into general scientific and pharmaceutical scientific divisions.

After the examination is passed and as a rule at its conclusion, the candidate must be practically employed for two years as qualified assistant in a pharmacy, one year of which must be in the German Empire. On the completion of the two years' service as qualified assistant the candidate may apply to the board for a license for the independent practice of pharmacy, which becomes authority for the independent conduct of a pharmacy throughout the German realm.

So much for the relation of the State to the individual that would enter the profession of pharmacist. A word regarding the relation of the State to the profession.

The number of pharmacies in Germany is regulated by government according to the population of each city, town, village or commune; the principle being that while every community shall be conveniently supplied the pharmacists shall not be so numerous as to prevent each from earning a reasonable income. The proportion of population to each pharmacy is theoretically from eight to ten thousand. The authority to grant concessions for new pharmacies is vested in the chief imperial officer in each province or district. Such concessions are valuable, the average being about $25,000. They are eagerly sought for and there are usually several applications on file for each new license about to be granted. Provision is made for protests against such new concessions by the neighboring pharmacists.

In conclusion let me set forth as clearly as I may five propositions from Europe's experience.

1. The problem is to so adjust the relations between the individual, the profession and the State that the individual shall attain the greatest measure of liberty; the profession the highest scientific standards; and the State the most efficient service.

2. If it is the duty of the State in the interests of the people to restrict the sale of drugs, medicines and poisons; to insist on their purity, quality and strength; to administer the law at the profession's expense: then the profession has a right to expect minimum expenditures, impartial administration, intelligent legislation.

3. If the profession owes the State the highest standards of efficient service, scientific practice, ethical ideals: then it has the right to claim the State's aid in securing qualified helpers; in prosecuting scientific research; in eliminating destructive competition.

4. If State and profession must accord individuals the greatest measure of liberty attainable; defer choice of profession to the last practicable moment; afford opportunity for full development: then have they not the right to insist that these opportunities be embraced? Choices be made permanent? Liberty be preserved inviolate?

5. Only higher standards and increased efficiency warrant changes which must ever safeguard existing rights and fulfil existing obligations.

Constructive criticism of present requirements, then, should be practical, desirable and attainable. The most pressing need is a more thorough and extensive general preliminary education; then, in turn, more practical experience, further professional study, better teaching, less cut rate competition and a lessening number of pharmacies.

I defer the discussion of these needs for other articles.

CORUNDUM.

By Walter C. Gold, Philadelphia.

During the last decade there has been a marked increase in the use of Corundum for the manufacture of grinding wheels. This is solely due to the discovery of an immense deposit of Corundum ore at Combermere, Barry's Bay, Ontario, Canada. This deposit was accidentally found by a resident of that region, Mr. Armstrong, in the year 1900. The whole face of the mountain, which is twenty miles from a railroad station, is literally covered with Corundum and its associates. Although the deposit yields but eight per cent. pure Corundum, it is so large (it is an immense "drift") that it pays to mine the mineral; besides, this is the only known deposit of any magnitude on this continent. There is some Corundum mined in India from which India Oil Stones have been manufactured; some in Australia and a little in Montana and Georgia, although the latter mines have been practically abandoned, the supply becoming exhausted. Years ago there was considerable Corundum mined at Hilltop, near Asheville, N. C., but these mines, too, were abandoned owing to the cost of the mining becoming too great. Some very fair grinding wheels were made years ago from this North Carolina and Georgia Corundum, which is usually found in a belt of serpentine in altered olivine rock; has gneiss for an immediate associate and in the decomposed rock are found the veins or beds of Corundum. The principal associates of Canadian Corundum are Spar, Iron, Pyrites and Mica. But the discovery of the Canadian mine effectually suppressed the operation of the Southern mines. The finest Corundum ever produced came from near Unionville, Chester County, Pa. Here the ore was of the blue sapphire variety and, here too, were found the only *true* loose crystals—pure crystalline Corundum, six sided and free from impurities. The writer possesses four of these crystals which weigh an average of two pounds, as follows:

No. 1	1 lb. 9 ozs.;	size, 1½″ × 3 ″
No 2	1 lb. 13 ozs.;	size, 2½″ × 2¾″
No. 3	1 lb. 9 ozs.;	size, 2 ″ × 3¼″
No. 4	3 lbs.;	size, 4 ″ × 3 ″

These mines were worked until 1893 and then abandoned, as the Corundum was found in "pockets" only. It was believed that if a tunnel was dug through the property where surface indications seemed to warrant such action, that a large deposit or lead would be encountered. Unfortunately, nothing but the associates of Corundum were found and after this costly experience, the mines were abandoned permanently. Throughout the section surrounding Unionville, surface pieces of the sapphire variety are frequently found and if a good "lead" could be located it certainly would prove a bonanza, as this Chester County ore produced the best grinding wheels of their type yet supplied the trade.

There are a number of varieties of Corundum: Sapphire, pink, cream and the white. The quality depends solely upon the percentage of Alumina or Oxide of Aluminium. The Canadian Corundum, when perfectly cleaned, contains about 95 per cent. Alumina. The Southern Corundum only contains about 75 per cent. Alumina on the average. The specific gravity is 3.95 to 4.050. Pure Corundum is number 9 in the scale of hardness, the diamond being rated as 10.

All the Canadian Corundum is washed after being crushed by great chilled rolls. The crushed ore is then run over a "water-table," across the surface of which it passes by specific gravity; the Corundum being heavier than its associates, drops first from the "table." The Corundum is then passed through a long cylindrical drier and from there it moves to the sieves or screens made from bolting cloth; and from these screens it is packed into bags of one hundred pounds, the number of the Corundum being determined by the mesh or number of holes to the square inch of cloth.

The principal numbers are as follows: 6, 8, 10, 12, 16, 24, 30, 40, 46, 54, 60, 70, 80, 90, 100, 120, 140, 150, 160, 180, F, FF, FFF, FFFF. The first eleven numbers are what are termed "coarse grain," the second nine are the "fine grain," and the last four are "flours."

As before noted, the Corundum is washed with water and then "concentrated" through the use of a concentrator to remove the micaceous associates and other foreign matter. Corundum so treated of course costs more to produce, but this treatment results in a pure article—one which will cut more keenly and prove more durable than otherwise. Unless the Corundum used in the manufacture of grinding wheels be *pure,* they are apt to crack, owing to the presence of foreign matter which "fluxes" into the kiln, the Vitrified Wheels being exposed to about 2500 degrees F. After the Corundum has been graded in numbers it is then run over a magnetic separator and the iron (about 4½ per cent.) is removed by this machine.

Much improvement has taken place in the manufacture of Corundum in recent years, the principal innovation being the "concentrating" machine, through the use of which the Corundum is "mulled." This process also removes the micaceous associates and relieves the Corundum of low-grade ore.

The consumption of Corundum in this country, for both grinding wheels and polishing purposes, is about 1,000,000 pounds per year. And the demand, which is principally for the manufacture of grinding wheels, is really greater than the supply.

The advantage in the use of Corundum over Emery for grinding purposes is that Corundum is harder and sharper (as will be quickly perceived by the use of a magnifying glass in the examination of the grains) but it has additionally a better " fracture " and, incorporated into grinding wheels, it is far superior to Emery in rapidity of cut and durability. It successfully competes with the two artificial abrasives, Alundum (electrically treated Bauxite) and Carborundum (Carbide of Silicon).

The duty on Canadian Corundum, which was one cent per pound, has been removed and it is, therefore, duty free. While, as previously stated, the amount of Corundum mined is largely used in the making of grinding wheels, it sells to the trade for polishing or grinding purposes for from ten to fifteen cents per pound, the price depending upon the grain desired as well as the quantity purchased at one time. Thus it will be observed that it is a commodity commanding a good price, considering the fact that but eight per cent. of the ore mined results in commercial Corundum.

RECENT PROGRESS IN SPECTROSCOPIC METHODS.[1]

By Prof. A. A. Michelson.
University of Chicago.

An observer who for the first time views the light of the sun through a prism can not fail to express his wonder and delight at the gorgeous display of colors into which the white light is separated —and if the observation is made under the same conditions as in the celebrated experiment of Newton, 1666, there is in truth nothing else which he could observe. You will remember that he allowed a beam of sunlight to stream through a round opening in a shutter of his window, falling on a glass prism, which bent the sun rays through different amounts depending on their color, thus spreading out the white round sunlit spot on the opposite wall into a colored band—the spectrum—which he rather arbitrarily divided into seven colors—red, orange, yellow, green, blue, indigo and violet. (If the division were made to-day I doubt if indigo would be included.) There is in fact no definite demarcation between these, and they shade insensibly into each other—and if the solar spectrum were always produced under these conditions we should say it was continuous, indeed if it were not the sun but an argand burner or an incandescent lamp which served as source, it would really be so.

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[1] Address of the president of the American Association for the Advancement of Science, Washington meeting, December, 1911. (Reprinted from *Science,* December 29, 1911.)

But even if the source consisted of isolated (but sufficiently numerous) separate colors, the fact would be disguised by the overlapping of the successive images. In other words the spectrum is not pure. In order to prevent this overlapping, two important modifications must be made in Newton's arrangement. First the light must be allowed to pass through a very *narrow aperture,* and second, a sharp *image* of this aperture must be formed by a lens or mirror.

The first improvement was introduced by Wollaston in 1802, who writes:

> If a beam of daylight be admitted into a dark room by a *crevice* 1/20 of an inch broad and received by the eye at a distance of 10 or 12 feet through a prism of flint glass held near the eye, the beam is seen to be separated into the four colors only, red, yellowish green, blue and violet. . . . The *line* that bounds the red side of the spectrum is somewhat confused. . . . The *line* between the red and green . . . is perfectly distinct; so also are the two limits of the violet. There are other distinct lines (in the green and blue . . . .).

The second improvement was effected by Fraunhofer, 1814, and by observing the light which fell from such a narrow aperture upon a prism by means of a *telescope* he discovered upward of 750 *dark lines* in the solar spectrum, and mapped their position and general character.

In recognition of the enormous importance of this discovery, these lines are always known as the Fraunhofer lines.

A minor inconvenience in Fraunhofer's arrangement lay in the fact that the slit source had to be at a considerable distance from the telescope; and this was obviated in the apparatus of Bunsen and Kirchhoff, 1860, which is essentially the same as the modern spectroscope of to-day; consisting of a slit and collimator, prism and observing (or photographic) telescope.

And on this beautifully simple device rests practically the whole science of spectroscopy, with all its wonderful applications and all the astonishing revelations of the structure and motions of the sidereal universe, and of the constitution of the atoms of matter of which it consists—nay even of the electrons of which these atoms are built!

Without the telescope it is evident that the science of spectroscopy would be as limited in its field as was the science of astronomy without the telescope. It is interesting indeed to compare the progress of the two sciences as dependent on the successive improvements in the two instruments.

Without the telescope nothing could be discovered concerning the heavenly bodies (with the exception of a few of the more evident features of the sun, the moon and the comets) except the brightness and places of the stars, and the motion of the planets—and even these could at best be very roughly determined (say to within one part in five thousand or something over a half minute of arc). Without the telescope spectroscopy would also have been limited to observations of general differences in character of radiations and absorptions, and a rough determination of the *position* of the spectral lines, with a probable error of this same order of magnitude.

In fact the *resolving power* of the eye is measured by the number of light waves in its diameter of the pupil, about 5,000, and if a double star (or a double spectral line) presents a smaller angle than 1/5,000 it is not "resolved." The resolving power of a telescope with a one inch objective would be about 100,000; so that details of the solar and lunar surfaces and of planets, nebulæ and of double stars and star groups can be distinguished whose angular distance is of the order of 1/100,000. The discs of the planets, the rings of Saturn, the moons of Jupiter, and some star groups and clusters, begin to be distinguishable. Our largest telescopes have a resolving power as high as 2,000,000, corresponding to a limit of separation of one-tenth of a second.

But in order to realize the full benefit of the telescope when used with a prism, the latter must be so large that the light which falls upon it entirely fills the object glass. The efficiency of the prism then depends on its size and on its dispersive power.

In order to form an idea of the separating or resolving power in spectroscopic observations it will be convenient to consider the Fraunhofer line *D* of the solar spectrum, or the brilliant yellow line corresponding to the radiation given out by a salted alcohol flame. This Fraunhofer recognized as a double line, and the length of the light-waves of the components are approximately .0005890 mm. and .0005896 mm. respectively. The difference is then 6/5,893 of the whole, or about 1/1,000, requiring a prism of resolving power of 1,000 to separate them. If the prism were made of flint glass with a base of 25 mm. it would just suffice to show that the line was double.

Now we know of groups of spectral lines whose components are much closer than those of sodium. For instance, the green radiation emitted by incandescent mercury vapor consists of at least six components, some of which are only a hundredth of this distance apart, and requiring therefore a resolving power of 100,000 to separate them. This means a glass prism of 100 inches, the construction of which would present formidable difficulties. These may be partially obviated by using twenty prisms of 5 inches each; but owing to optical imperfections of surfaces and of the glass, as well as the necessary loss of light by the twenty transmissions and forty reflections, such a high resolving power has not yet been realized.

The parallelism of the problems which are attacked in astronomy and in spectroscopy is illustrated in the following table. It is interesting to observe how intimately these are connected and how their solution depends on almost exactly the same kind of improvement in the observing instruments, particularly on their *resolving power;* so that not only are the older problems facilitated and their solution correspondingly accurate, but new problems before thought to be utterly beyond reach are now the subject of daily investigation.

Astronomical	Spectroscopic
1. Discovery of new stars, nebulæ and comets.	Discovery of new elements.
2. Star positions.	Wave-length of spectral lines.
3. Double stars and star clusters.	Double lines, groups and bands.
4. Shape and size of planets and nebulæ. ? Star discs.	Distribution of light in spectral "lines."
5. Star motions (normal to line of sight). Resolution of doubles, solar vortices, protuberances, etc.	Star motions (parallel with the line of sight). Resolution of doubles, solar vortices, protuberances, etc.
6.	Changes of character and position of lines with temperature, pressure and magnetic field.
7. Spectroheliograph. (Combination of telescope and spectroscope.)	

We must especially note that the newer problems require an enormous resolving power. In the telescope this has been accomplished partly by the construction of giant refractors and partly by enormous reflectors; and curiously enough the same double path is open to spectroscopy; for we may employ the dispersive power of refracting media or the diffractive power of reflecting media. The increasing cost and difficulty of producing large transparent and homogeneous blocks of glass have tended to limit the size and efficiency of lenses and of prisms, and these have been more or less successfully replaced, the former by mirrors, and the latter by *diffraction gratings.*

These are made by ruling very fine lines very close together on a glass or a metal surface. The effect on the incident light is to alter its direction by an amount which varies with the wave-length —this is, with the color; and a spectrum is produced which may be observed to best advantage by precisely the same form of spectrometer, with a substitution of a grating for the prism.

The dispersion of a diffraction grating depends upon the closeness of the rulings; but the resolving power is measured by the total number of lines. It is important, therefore, to make this number as large as possible.

The first gratings made by Fraunhofer, 1821, contained but a few thousand lines and had a correspondingly low resolving power —quite sufficient, however, to separate the sodium doublet. A considerable improvement was effected by Nobert, whose gratings were used as test objects for microscopes, but these were still very imperfect as spectroscopic instruments, and it was not till Rutherford, of New York (1879), constructed a ruling engine with a fairly accurate screw, that gratings were furnished which compared favorably with the best prisms in existence.

With 30,000 lines (covering over 40 mm.) the theoretical resolving power would be 30,000; practically about 15,000—sufficient to separate doublets whose components were only one fifteenth as far apart as those of the sodium doublet.

An immense improvement was effected by Rowland (1881), whose gratings have been practically the only ones in service for the last thirty years. Some of them have a ruled surface of 150 mm. × 60 mm., with about 100,000 lines and can separate doublets whose distance is only one one-hundredth of that of the sodium doublet, in the spectrum of the first order. In the fourth order, it should resolve lines whose distance is only one-fourth as great.

Practically, however, it is doubtful if the actual resolving power is more than 100,000; the difference between the theoretical and the actual performance being due to the defect in uniformity in the spacing of the grating furrows.[2]

The splendid results obtained by Rowland enabled him to produce the magnificent atlas and tables of wave-lengths of the solar spectrum which are incomparably superior in accuracy and wealth of detail to any previous work; so that until the last decade this work has been the universally accepted standard. With these powerful aids it was possible not only to map the positions of the spectral lines with marvellous accuracy, but many lines before supposed simple were shown to be doublets or groups; and a systematic record is given of the characteristics of the individual lines, for example, whether they are intense or faint, nebulous or sharp, narrow or broad, symmetrical or unsymmetrical, reversed, etc.—characteristics which we recognize to-day as of the highest importance, as giving indications of the structure and motions of the atoms whose vibrations produce these radiations.

One of the most difficult and delicate problems of modern astronomy is the measurement of the displacement of spectral lines in consequence of the apparent change of wave-length due to "radial velocity" or motion in line of sight. This is known as the Doppler effect and had been well established for sound waves (a locomotive whistle appears of higher pitch when approaching and lower when receding) but it was only confirmed for light by Huggins and by Vogel in 1871, by the observation of displacements of the solar and stellar spectral lines on observing in succession the advancing and the receding limb of the sun.

It may be worth while to indicate the accuracy necessary in such measurements. The velocity of rotation of the sun's equator is approximately two kilometers per second, while the velocity of light is 300,000 kilometers per second. According to Doppler's principle the corresponding change in wave-length should be 1/150,000 —a quantity too small to be "resolved" by any prism or grating then in existence. But by a sufficient number of careful micrometer measurements of the position of the middle of a given spectral line, the mean values of two such sets of measurements would show the required shift. It is clear, however, that if such radial velocities are to be determined with any considerable degree of accuracy, nothing short of the highest resolving power of the most powerful gratings should be employed.

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[2] This applies to all the Rowland gratings which have come under my notice, with the exception of one which I had the opportunity of testing at the Physical Laboratory, University of Göttingen. The resolving power of this grating was about 200,000.

Another extremely important application of spectroscopy to solar physics is that which in the hands of Hale and Deslandres has given us such an enormous extension of our knowledge of the tremendous activities of our central luminary.

The spectroheliograph, devised by Hale in 1889, consists of a grating spectroscope provided with two movable slits, the first in its usual position in the focus of the collimator, and the second just inside the focus of the photographic lens. A uniform motion is given to the two slits so that the former passes across the image of the solar disc, while the other exposes continually fresh portions of the photographic plate.

If the spectroscope is so adjusted that light of the wave-length of a particular bright line in a solar prominence (say one of the hydrogen or the calcium lines) passes through the spectroscope then a photograph of the prominences, or sun spots or faculæ, etc., appears on the plate. But the character of this photograph depends on the portion of the bright spectral "line" which is effective, and as the entire range of light in such a line may be only a thirtieth part of the distance between the sodium lines, it would require a resolving power of at least 100,000 to sift out the efficient radiations so that they do not overlap.

As another illustration of the importance of high resolving power in attacking new problems, let us consider the beautiful results of the investigations of Zeemann on radiation in a magnetic field. The effect we know is a separation of an originally simple radiation into three or more, with components polarized at right angles to each other. This is one of the very few cases where it is possible to actually alter the vibrations of an atom (electron) and the fact that the effect is directly calculable, as was first shown by Lorentz, has given us a very important clue to the structure and motions of the atoms themselves.

The experiment is made by placing the source of radiation (any incandescent gas or vapor) between the poles of a powerful electromagnet and examining the light spectroscopically. Now this experiment had been tried long before by Faraday but the spectroscopic appliances at his disposal were entirely inadequate for the purpose.

Even in the original discovery of Zeemann only a broadening of the spectral line was observed, but no actual separation. In fact, the distance between components which had to be observed was of the order of a hundredth of the distance between the sodium lines, and in order to effect a clear separation and still more to make precise measurements of its amount, requires a higher resolving power than was furnished by the most powerful gratings then in existence.

As a final illustration, let us consider the structure of the spectral " lines " themselves. Rowland's exquisite maps had shown many of these which were then thought simple, to be double, triple or multiple, and there are clear indications that even the simpler lines showed differences in width, in sharpness and in symmetry. But the general problem of the distribution of light within spectral lines had scarcely been touched. Here also the total " width " of the line is of the order of one one-hundredth of the distance between the sodium lines and it is evident that without more powerful appliances further progress in this direction was hopeless.

Enough has been said to show clearly that these modern problems were such as to tax to the utmost the powers of the best spectroscopes and the experimental skill of the most experienced investigators.

Some twenty years ago a method was devised which, though somewhat laborious and indirect, gave promise of furnishing a method of attack for all these problems, far more powerful than that of the diffraction grating.

Essentially, the extremely simple apparatus which is called the interferometer consists of two plane glass plates. These can be made accurately parallel and their distance apart can be varied at will. When light is reflected from the surfaces which face each other, the two reflected beams of light waves " interfere " in such a way as to add to each other, giving bright maxima, or to annul each other's effect, producing dark spaces between.

The alterations of light and darkness which occur when the eye observes in the direction of the normal are very marked so long as the plates are very near together—but as this distance increases, the interferences become less and less distinct until at a distance *which depends on the character of the incident light* they vanish completely. A perfectly definite relation holds between the " visibility curve " and the character of the radiation so that the one can be deduced from the other.

Now the " resolving power " of such an apparatus is measured by the number of light waves in the double distance between the surfaces. This is about 100,000 for a distance of one inch; but the distance is in fact *unlimited* and as the instrument itself is practically free from errors of any sort, its resolving power is practically unlimited.

The use of this method of light wave analysis is attended with certain difficulties, and the results obtained are not always free from uncertainties; but in view of the fact that at this time no other methods of this power had been devised, it has amply proved its usefulness. Among the results achieved by it may be mentioned: the resolution of many lines supposed single into doublets, quadruplets, etc.; the measurement of their distances apart; the distribution of light in the components; the measurement of their width and the changes produced in them by temperature, pressure, and presence of a magnetic field.

Among the radiations thus examined one proved to be so nearly homogeneous that over two hundred thousand interference bands could still be observed. Otherwise expressed, the exact number of light waves in a given distance, say ten centimetres, could always be determined; and by a comparison with the standard meter the absolute wave-length of this radiation could be measured and made to serve as a basis for all wave-lengths.

The standard of length itself, the standard meter, is defined as the distance between two lines on a metal bar; and notwithstanding all the care taken in its manufacture and preservation, there is no assurance that it is not undergoing a constant slow change, doubtless very small, but appreciable by the refinements of modern metrological methods, if there were any fundamental unchangeable standard with which it could be compared. The earth's circumference was supposed to be such a standard and the meter was originally defined as the millionth part of an earth-quadrant; but the various measurements of this quadrant varied so much that the idea was abandoned. The attempt to base the standard on the length of a seconds-pendulum was no more successful.

But we have now the means of comparing the standard meter with the length of a light wave (the standard meter contains 1,553,163 waves of the red radiation from cadmium vapor) so that should the present standard be lost or destroyed, or should it vary in length in the course of years, its original value can be recovered so accurately that no microscope could detect the difference. True it is that in the course of millions of years the properties of the atoms which emit these radiations and the medium which propagates them may change—but probably by that time the human race will have lost interest in the problem.

The difficulties in the application of the interferometer method of investigating the problems of spectroscopy, it must be admitted, were so serious that it was highly desirable that other instruments should be devised in which these difficulties were avoided. This need was supplied by the "echelon," an instrument based on the same principle as the diffraction grating, but consisting of a pile of glass plates of exactly equal thickness and forming a kind of stairs, whence its name.

The grating acts by assembling light-waves whose successive wave trains are retarded by some *small* whole number of waves (usually less than six, the distance between the grating spaces being about six light-waves), whereas this retardation in the echelon is many thousand.

But the resolving power depends on the *total* retardation of the extreme rays, and this may be made very large, either by having an enormous number of elements with small retardations—or by a comparatively small number of elements with large retardations. For example, an echelon of thirty plates of glass one inch thick, each producing a retardation of 25,000 waves, would have a resolving power 750,000—about seven times that of the grating; and this high value has actually been realized in practice.

Simultaneously Perot and Fabry showed that by the repeated reflections between two silvered surfaces[3] a very high resolving power is obtained, and a few years later Lummer devised the plate interferometer which embodies practically the same idea.

The resolving power of all of these newer devices is clearly many times as great as that of the grating—but all equally share the objection which holds (but to a far less extent) for the grating, that the different succeeding spectra overlap. It is true that this difficulty may be overcome (though with some loss of simplicity and considerable loss of light) by employing auxiliary prisms, gratings, echelons, etc., and in this form all these modern instruments have contributed results of far reaching importance, and which would have been impossible with the older instruments.

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[3] Boulouch, 1893, had observed that Na rings were doubled both by reflection (grazing incidence) and transmission (normal incidence) with a light silver film.

The diffraction grating possesses so many advantages in simplicity and convenience of manipulation that it is even now used in preference to these modern instruments, save for such refinements as require an exceptionally high resolving power. But has the resolving power of the grating been pushed to the limit? We have seen that this depends on the number of rulings; and it is certainly possible to increase this number. But the theoretical value is only reached if the rulings are very accurately spaced; for instance, the resolving power of the Rowland grating is only one-third of its theoretical value. This is a direct consequence of inaccuracies in the spacing of the lines. If a grating could be constructed of say 250,000 lines with exact spacing, the resolving power would be equal to that of the most powerful echelon. The problem of the construction of such gratings has occupied my attention for some years; and while it has met with some formidable difficulties, it has had a fair measure of success and gives promise of still better results in the near future.

The essential organ in all ruling engines in actual use is the screw which moves the optical surface to be ruled through equal places of the order of a five hundredth to one thousandth of a millimeter at each stroke; and the principal difficulty in the construction of the machine is to make the screw and its mounting so accurate that the errors are small compared with a thousandth of a millimeter.

This is accomplished by a long and tedious process of grinding and testing which is the more difficult the longer the screw. A screw long enough to rule a 2-inch grating could be prepared in a few weeks. Rowland's screw, which rules 6-inch gratings, required two years or more—and a screw which is to rule a grating 15 inches wide should be expected to take a much longer time, and in fact, some ten years have been thus occupied.[4]

I may be permitted to state a few of the difficulties encountered in this work—some of which would doubtless have been diminished if my predecessors in the field had been more communicative.

First, is the exasperating slowness of the process of grinding and testing the screw. This can not be hurried, either by grinding at greater speed, or by using any but the very finest grade of grinding material. The former would cause unequal expansions of the screw by heating; and the latter would soon wear down the threads till nothing would be left of the original form.

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[4] A method of ruling gratings accurately, which is independent of any mechanical device, is now in process of trial, in which the spacing is regulated by direct comparison with the light-waves from some homogeneous source such as the red radiations of cadmium.

Secondly, in ruling a large grating, which may take eight to ten days, the ruling diamond (which must be selected and mounted with great care) has to trace a furrow several miles long in a surface as hard as steel—and often breaks down when the grating is half finished. The work can not be continued with a new diamond and must be rejected and a new grating begun.

Thirdly, the slightest yielding or lost motion in any of the parts —screw, nut, carriage or grating, or of the mechanism for moving the ruling diamond—is at once evidenced by a corresponding defect in the grating. When after weeks or sometimes months of preparation all seems in readiness to begin ruling, the diamond point gives way and as much time may have to be spent in trying out a new diamond.

When the accumulation of difficulties has seemed insurmountable, a perfect grating is produced, the problem is considered solved, and the event celebrated with much rejoicing, only to find the next trial a failure. In fact, more time has been lost through such premature exhibitions of docility than in all the frank declarations of stubborn opposition!

One comes to regard the machine as having a personality—I had almost said a feminine personality—requiring humoring, coaxing, cajoling—even threatening! But finally one realizes that the personality is that of an alert and skilful player in an intricate but fascinating game—who will take immediate advantage of the mistakes of his opponent, who "springs" the most disconcerting surprises, who never leaves any result to chance—but who nevertheless plays fair—in strict accordance with the rules of the game. These rules he knows and makes no allowance if you do not. When *you* learn them and play accordingly, the game progresses as it should.

As an illustration of the measure of success attained in this work, I would call attention to a recent comparison by Messrs. Gale and Lemon of the performance of a grating of 6½-inch ruled surface with that of the echelon, the Perot and Fabry interferometer and the Lummer plate. The test object is the green radiation from incandescent mercury vapor. The spectrum of this radiation had been supposed a simple line, until the interferometer showed it to be made up of five or more components. The whole group occupies a space about one-fifteenth of that which separates the sodium lines.

The grating clearly separates six components while the more recently devised instruments give from six to nine. Two of these components are at a distance apart of only one hundred and fiftieth of the distance between the sodium lines, and these are so widely separated by the grating that it would be possible to distinguish doublets of one-half to one-third of this value; so that the actual resolving power is from 300,000 to 400,000—of the same order, therefore, as that of the echelon.

It may well be asked why it is necessary to go any further. The same question was put some twenty years ago when Rowland first astonished the scientific world with resolving powers of 100,000—and it was his belief that the width of the spectral lines themselves was so great that no further " resolution " was possible. But it has been abundantly shown that this estimate proved in error, and we now know that there are problems whose solution depends on the use of resolving powers of at least a million, and others are in sight which will require ten million for their accurate solution, and it is safe to say that the supply will meet the demand.

To return to our comparison of the telescope and the spectroscope: while the progress of investigation of the stellar universe will be ever furthered by increased size and resolving power of the telescope, this is very seriously hampered by the turbulence of the many miles of atmosphere through which the observations must be made. But there is no corresponding limit to the effective power of spectroscopes and the solution of the corresponding problems of the sub-atomic structures and motions of this ultra-microscopic universe may be confidently awaited in the near future.

The message we receive from the depth of the stellar firmament or from the electric arcs of our laboratories, come they in a millionth of a second or in hundreds of light years, are faithful records of events of profound significance to the race. They come to us in cipher—in a language we are only beginning to understand.

Our present duty is to make it possible to receive and to record such messages. When the time comes for a Kepler and a Newton to translate them we may expect marvels which will require the utmost powers of our intellect to grasp.

CHINESE CAMPHOR TRADE.

[From Consul General George E. Anderson, Hongkong.]

Efforts to increase the output of camphor from China to the amount exported several years ago, notably in 1907, are again being made, chiefly by Japanese dealers who appear to have more or less connection with the camphor monopoly in Formosa.

Applications have been made recently at several points in the interior of both Fukien and Kwangtung Provinces for permission to establish camphor stills near localities where a sufficient number of camphor trees had been found. One such application for a factory in the district of Tung-on, in Kwangtung Province, is said to have met considerable local opposition and the scheme for the time being is inoperative. However, the movement has led to increased interest on the part of the Chinese business men themselves, and it is thought that there will be some practical result during the coming year.

HISTORY OF THE CHINESE INDUSTRY.

The camphor industry in China has so far had a precarious course, largely because of its nature. Camphor has been made for many years by distilling chips of the camphor trees, and the product was among the first exported from China. Camphor trees are, or at least have been, common over most of Kwangtung, Fukien, parts of Chekiang, Kwangsi, Hunan, Yunnan, Kiangsi, and Szechuan Provinces, in short, over much of South China. The richest groves were in Formosa, which island China lost to Japan after the Chino-Japanese War. The manner in which the Japanese Government took over the camphor business in Formosa, made it a Government monopoly, and instituted the policy of planting camphor trees to replace those destroyed, is well known.

Since that time the business in China has rested upon the ordinary and natural growth of the trees, without special effort to grow more trees or protect those already started. In fact, because of certain taxes and other restrictions there has been a disposition at times to neglect and even destroy such trees. In 1905, however, the demand for camphor in the world by reason of its increased use industrially became so great as to lead to abnormally high prices. Although the business was largely controlled at that time by the Japanese Government through its Formosan monopoly, the high prices caused an extraordinary production in China, and at one time a partially successful attempt was made in Fukien Province to form Chinese provincial monopoly, which was broken up largely through the efforts of foreign business men and the operation of independent people.

EFFECT OF HIGH PRICES—EXPORT STATISTICS.

The unusually high prices in 1906 and 1907 led not only to extraordinary shipments from China but also to the manufacture of artificial, or synthetic, camphor, the production of which resulted in prices becoming more moderate, although, owing to the fact that artificial camphor can not be made cheaply, prices were not low. Meanwhile the unusual production had caused the destruction of a large portion of the camphor trees in China near points convenient to the seaboard, and this fact, as well as reduced prices, led to a restriction of China's output.

The history of the business is clearly outlined in the export statistics. In 1905 China exported camphor to the value of $265,624; in 1906 the value of the exports was $1,048,633, and in 1907 it had advanced to $1,641,205; in 1908 it fell to $552,588, and in 1909 fell still further to $428,921. The figures for 1910 are not yet available, but during the first half of the year exports were about one-fourth those of 1909 and the business declined to the lowest point recorded in the past six years.

CHANGE OF SOURCE OF SUPPLY—FIELDS AVAILABLE.

Perhaps the most significant fact is the change in source of supply as indicated by the port of shipment. In 1905 and 1906 practically all of the exports were from Foochow and Amoy by way of Hongkong. In 1907 over 80 per cent. was from Foochow by way of Hongkong, but in 1908 only about 50 per cent. was from Foochow, Amoy, and Swatow, while Kiukiang with 24 per cent. and Shanghai with 13 per cent. came into the list. In 1909 the share of the northern ports was comparatively larger. In other words, the camphor producers, who had been operating in the country between the coast range of mountains and the hills and who had been shipping their product to the seaboard, had crossed the hills into the interior valleys and on the valley side of the ridge and were shipping the product down river to the Yangtze ports.

The significance of this fact is not so much that the supply of trees on the coast has been exhausted, though those available for industrial purposes have been used up rapidly, but that more trees are available in the interior. The camphor possibilities of China are much greater than its production has ever indicated. The output in 1907, which was 3,433,937 pounds, valued at $1,641,205, is about half the present output of Formosa. In its best days the business in China was without adequate organization, while in Formosa it had been and now is under effective control. In China camphor trees are not found close together as they are in the primeval forests of Formosa, but they cover vastly greater territory. The actual possibilities of camphor production in China are far beyond those of Formosa. What the present commercial prospect may be, however, is a different matter.

QUALITY OF CHINESE CAMPHOR—PROBABLE DEVELOPMENT OF INDUSTRY.

Chinese camphor is inferior in quality to the Formosan camphor, chiefly because the crude methods of manufacture employed leave a greater amount of impurities in it, and because of the wasteful means of production the Chinese product costs more than it should. Foochow camphor is of better quality than that made in Kwangtung, the natives of Foochow being further advanced in its manufacture. Chinese camphor is not the finely refined and crystallized product known to American and European markets, but resembles coarse, dark sugar. It is sold in the market here by the picul of 133 pounds, and is generally packed in tin-lined cases containing 1 picul each. There is no reason why Chinese camphor should not be marketed in as good quality and condition as that of Formosa or any other locality if the trade is looked after and its manufacture encouraged.

In spite of the fact that beyond a certain price synthetic camphor can be counted upon to supply the market and that there is not the probability of a repetition of the extraordinary demand and the extraordinary situation of 1907, or of the complete control of the industry which the Formosan monopoly might indicate, it seems probable that the price of camphor will remain high indefinitely. Continued good prices will doubtless lead to immediate development of the Chinese industry, but it will be in territory not heretofore exploited. Development will depend largely on finding economical means of transportation, and this accomplished the exports will again increase. The completion of the Canton-Hankow railway, for example, is almost certain to develop the industry in the territory along the route in which there is a fair supply of camphor trees, the exploitation of which will become profitable because of the new transportation facilities.

DESTINATION OF EXPORTS.

Ordinarily about 55 per cent. of the exports of camphor from China is shipped through Hongkong, France taking about half the remainder direct. Great Britain takes about 14 per cent. and the United States about 2.5 per cent. direct. In 1907 Hongkong shipped direct to the United States camphor to the value of $359,757; in 1908 the amount was only $4,104; in 1909 only $3,224, and in 1910 there was not a single direct shipment. However, much of that shipped to Europe is diverted to the United States on orders before its arrival in Europe. The trade here at present is altogether in the control of several German firms.

BOOK REVIEWS.

Bacteria in Relation to Plant Diseases. By Erwin F. Smith, in charge of Laboratory of Plant Pathology, Bureau of Plant Industry, U. S. Department of Agriculture. Volume 2. History, General Considerations, Vascular Diseases. Washington, D. C. Published by the Carnegie Institution of Washington, 1911.

Students of plant diseases as well as those interested in the study of pathogenic micro-organisms have been waiting patiently during the past few years for the second volume of Dr. Smith's work upon "Bacteria in Relation to Plant Diseases." The first volume was devoted to the consideration of the technique employed in the study of bacteria and was a very helpful contribution to all laboratory workers in this field and appreciated by all classes of students in bacteriology.

Volume 2 deals with general questions relative to bacterial diseases of plants; the history of the subject; the distribution of bacteria on the surface of plants; the questions involved in the terms parasitism and symbiosis; the action of bacteria on various tissues; the reaction of the plant; the inter-relations of animal and plant parasites; the problems relating to prevention; and finally special chapters dealing with the wilt of cucurbits, the black rot of crucifers and the yellow disease of hyacinths.

Dr. Smith has been one of the pioneers in the study of plant diseases. He is among the few survivors of those who have seen the Bureau of Plant Industry of the U. S. Department of Agriculture grow from a department with but one man (Dr. Vasey) until to-day it is one of the largest and one of the most influential bureaus of the Department of Agriculture. It is as an earnest student that Dr. Smith has devoted himself to the study of the problems connected with the destruction of the crops of the farmer and the plants of the horticulturist. He has been among those who have developed the technique for the study of plant diseases, and very early saw that for every plant disease there was a specific cause. He did not lay back and content himself with saying that the excessive humidity due to the rains, or the ozone in the air after thunder-storms, or the intensity of the sun's rays, or even sudden changes in temperature were responsible for the destruction of the farmer's crops. He went at each problem as a true scientist, not counting the pains and patience required, nor being baffled by the confusion that reigned even among the investigators themselves. He followed his work in much the same spirit as Pasteur and Koch and was rewarded with returns, the value of which are hardly appreciated even by his fellows. Dr. Smith has not only pursued his investigations with a singleness of purpose, but has aroused the sympathy and earnest co-operation of both his associates in the Bureau of Plant Industry, and of his fellow-workers throughout the world. This co-operation has been of great advantage to the author in securing for him many of the results given in his work. In addition Dr. Smith possesses a lucidity of style in presenting his facts, which gives a charm to his publications and which is especially characteristic of the present volume on "Bacteria in Relation to Plant Diseases." In fact this volume is not only a scientific contribution of an exemplary character but as an interesting narrative of achievement it will doubtless take rank as one of the classics in botanical literature.

In the historical treatment of the subject the author shows a broad tolerance for those who a comparatively few years ago did not see the unmistakable evidence that had been slowly accumulating and tending to establish the truth that bacteria were the causes of very many plant diseases as surely as they were in the case of animals. Really, *a priori* reasoning would seem to have warranted such an assumption. It is at times like this when success in an unexplored field of science is attained that the great men, who even though they did not participate in the discoveries, stand out most prominent. De Bary was one of these, for even in 1884 he says: "As Hartig has already pointed out, bacteria living in plants parasitically have scarcely been observed. The generally acid reaction of plant parts may be a partial explanation of this. Recently, however, Wakke has described as the yellow sickness, a disease of hyacinths in Holland, in which the characteristic symptom consists in the presence of shiny yellow bacterial masses in the vessels, etc. . . . . More exact investigations upon this phenomena must be awaited."

At the present time we know as has been well stated by Conn that "the proof of the existence of bacterial plant diseases stands in identically the same basis as the proof of bacterial diseases among animals." In this connection the reviewer has thought it well to quote from Duggar's recent work on "Fungous Diseases of Plants," in which will be found an excellent chapter on the bacterial diseases of plants. He says of the Schizomycetes (bacteria): "A relatively small number of species included in a single family (so far as present knowledge goes) produce diseases in plants. These diseases, however, rank among the most important, both on account of the destructive action of these organisms and the great difficulty experienced in attempting to develop effective means of control. The number of phytopathological forms is annually augmented, and it is probable that they will be reckoned as relatively more important as further investigations are made."

Not a single plant that has an economic value, can be grown on a commercial scale without sooner or later showing signs of disease and indeed we have seen in the cultivation of medicinal plants the industry entirely given up in certain instances because the plants could not survive. Some recent observations tend to show that this was not so much due to climate as to diseased conditions of the plants, which were largely aggravated by the conditions of the particular localities in which they were growing. The bacterial diseases of plants spring up as suddenly as those in the case of man and the lower animals under domestication, and they are among the most perplexing that confront the plant pathologist, requiring a high order of intuition and skill upon the part of the investigator who may undertake to determine their specific nature.

Dr. Smith in the present volume has fortunately brought together not only the extensive researches on the root nodules of Leguminosæ, and the vascular diseases due to bacteria, but he has also considered such questions as the action of bacteria upon cell-walls, the germicidal treatment of seeds, etc. He has also brought together in ready available form the studies on " Kefir," " the ginger-beer plant," etc. These latter subjects are growing in importance and the literature is usually either inaccessible or contains so much that is contradictory that it becomes of very little practical value.

The illustrations number about 150 and are very excellent. There are four very beautiful colored plates, one of the wilt of cucumber, another on the black rot of cabbage, and two on the yellow disease of hyacinths. The printing and general appearance of the book is in keeping with the standard of excellence of the press of the Carnegie Institution. While the value of expenditures for research may be problematical there can be no question of the enduring benefit that arises from the publication of works of this character. It is indeed an act of patriotism on the part of the founder of the Carnegie Institution when he makes it possible for scientific work such as this which is enduring and is the product of an American, to be accessible to students of science throughout the world. One may look upon the Carnegie Institution as doing for the government of the United States what every other civilized nation throughout the world is doing to encourage science, benefit humanity, and incidentally to maintain the prestige of that nation among the other nations of the world. H. K.

THE BRITISH PHARMACEUTICAL CODEX, 1911. An Imperial Dispensatory for the use of Medical Practitioners and Pharmacists. Published by Direction of The Council of The Pharmaceutical Society of Great Britain, London. The Pharmaceutical Press, 721 Great Russell Street, W. C. 1911.

Though identical in title with the "British Pharmaceutical Codex, 1907" this book is to all intents and purposes a new work that has little in common with the previous edition apart from the name and the general appearance given it by the binder.

As a purely pharmaceutical creation this book is unique and it would be indeed difficult to find, in so condensed and presentable a form, anything like the information that is embodied, in the 1570 or more printed pages that are included within its covers.

Pharmacists who were fortunate enough to secure a copy of the first edition of the B. P. C. will surely desire a copy of this second edition while others who failed to secure the first edition should certainly endeavor to secure a copy of the revised book if they desire to keep in touch with the progress that is being made in their calling.

The compilation, in its original form, was quite properly characterized as being one of the most comprehensive and most practical of the extra official pharmacopœias in the English speaking world and it is to be expected that the book in its present revised form will have an even wider field of usefulness. During the three years that the book has been in the making the members of the Codex Revision Committee have succeeded in compiling an unusual amount of valuable pharmaceutical information and have also succeeded in devising a plan for the presentation of this material that is particularly well adapted for a book designed for reference by pharmacists in their every day work. From Abrus to Zizyphus the monographs number 1040 and cover exactly 1100 pages. With the description of each drug there is included an enumeration of the known and used pharmaceutical preparations. The comprehensiveness of this enumeration is perhaps best illustrated by the fact that under Aloes alone no less than 33 distinct preparations are described. The index, which covers 98 three column pages, includes upwards of 15,000 references, is another indication of the comprehensiveness of the book. One rather interesting feature of the first part of the Codex is the fact that the preparations included in the Protocol of the Brussels Conference are included with the affix: P. I. This recognition of the now widely adopted international standards for preparations of potent drugs is particularly gratifying in that it no doubt presages favorable consideration for these standards on the part of the editors of the Ph. Brit. itself.

The B. P. C. Formulary, now a distinct feature of the Codex, covers 335 pages and includes upwards of 1375 formulas, many of them valuable and all of them interesting in that they serve to reflect a development or lack of development in medicine as practiced in the British Empire at the present time.

The remaining pages of the Codex are devoted to the presentation of a number of tables including a table of atomic weights based on the atomic weights adopted by the International Committee in its report for the year 1911, also a table of Metric weights and measures and of Imperial weights and measures and a table of percentage equivalents. Eighteen of the concluding pages are devoted to a pharmacological and therapeutic index.

This latter feature of the book has already been liberally criticised in medical as well as pharmaceutical journals and it would appear that the position taken by some of the critics is unassailable. Thus one rather favorable reviewer points out that no pharmacological or therapeutic doctrine is at the present time so well established that it can be held to be universally established or final and that the presentation of such a doctrine by a committee of a representative society would be apt to suggest that there exist orthodox methods of treatment to which the prescriber ought to adhere.

Another critic points out that even granting that it were advisable to issue such a list from a corporate society the authority selected should not be a pharmaceutical society.

One other feature that does not appear to have received the amount of thought that its importance would appear to warrant is the nomenclature. Both in connection with synthetic remedies in the body of the book and the complex galenicals in the B. P. C. Formulary the committee appears to have ignored established practices in other parts of the world, even of the English speaking world, as not a few N. F. and U. S. P. titles are practically duplicated for preparations that are of a distinctly different nature. In this one direction the B. P. C. is but another illustration of the inherent provincialism of the Anglo Saxon and the correctness of the truism, quoted more than a century ago in the preface of the Pharmacopœia of the Massachusetts Medical Society, that "in this as in former periods men are creating confusion by creating names."

Despite its several shortcomings, however, and despite the redundancy of the material contained in it, the British Pharmaceutical Codex, 1911, should be owned by every real pharmacist in this country and should be consulted and studied because of the influence that it is sure to have on the development of our own National standards and on the evolution of pharmacy as a whole.

M. I. W.

THE INFLUENCE OF CERTAIN DRUGS UPON THE TOXICITY OF ACETANILID AND ANTIPYRINE. By Worth Hale, Bull. No. 53, Hygienic Laboratory, U. S. Public Health and Marine-Hospital Service, Washington.

Acetanilid and antipyrine in combination with caffeine, sodium bicarbonate, salicylates, bromides, morphine and codeine were studied by means of experiments upon frogs, white mice, and guinea pigs. The deleterious effect of acetanilid upon the heart is very imperfectly antagonized by caffeine and it is shown to increase the toxicity of acetanilid mixtures when given to the intact animal.

Sodium bicarbonate, quite in contrast, appears to markedly lessen the poisonous effects of acetanilid upon the heart and also lessens the toxicity when given the intact animal.

The combinations of the alkaloids of the morphine group also increase the toxic effects of acetanilid, while mixtures containing salicylic acid and the bromides seem not to alter its poisonous effects in any way.

Caffeine is not materially antagonistic to the circulatory depression following antipyrine, but prevents the slowing in the heart-rates. It increases the toxicity when given the intact animal. Sodium bicarbonate was somewhat antagonistic to the heart effect of antipyrine, but when given to the intact animal it did not seem to lessen the toxicity in any degree.

The antagonistic action of sodium carbonate to acetanilid is graphically shown, the degree of toxicity being represented by the length of the bars.

Salipyrine, a chemical combination of antipyrine and salicylic acid and claimed by the American firm selling the product to be non-toxic, was compared with a mixture composed of antipyrine and salicylic acid in the same proportion as occur in the chemical compound. The mixture was found to be no more toxic than the chemical compound.

JOHN R. RIPPETOE.

PUBLIC LECTURES.

DYEWOODS AND DYEWOOD EXTRACTS.

On January 5th Mr. T. Chalkley Palmer, Chemist of the American Dyewood Company, Chester, Pa., gave an illustrated lecture on "Dyewoods and Dyewood Extracts," in the Philadelphia College of Pharmacy. The lecturer spoke of the dyewood industry under the three main heads of past history, present methods of manufacture, and applications of the products to fabrics.

Under the first head it was pointed out that we know very little definitely concerning the usual methods of dyeing blacks previous to the discovery of America, and that the most important of the dyewoods, which are logwood, fustic and quercitron, came into use as a result of Spanish explorations. Logwood, known then as "Spanish logs" was in the days of Elizabeth in evident competition with some unknown British dyewares, for its use was forbidden by statute under savage penalties of mutilation or even death. But in spite of legislation its employment grew with growing manufactures of fabrics, in both Europe and the Continent. During the nineteenth century, dyewood factories developed in France, Germany, England and Scotland. The successors of these still flourish in Havre, Rouen, Suresnes, Bury near Manchester, and in and near Glasgow. In America, starting with the primitive grinding mill of Partridge on Manhattan Island, about the beginning of that century or a little earlier, the industry developed large works at and about New York, Boston, Stamford and Philadelphia. At present the great bulk of the American manufacture of dyewood products is concentrated at Chester, Pennsylvania. There are two important works in Jamaica, at Spanish Town and at Lacovia. The industry shows no signs of languishing, and the world's present annual consumption of the three main dyewoods is estimated at 250,000 tons. Of this, about 200,000 tons are credited to logwood.

Methods of preparing the raw material were briefly sketched. The "fermented" logwood chips were shown in contrast with the untreated chips, and the advantage of ageing was stated to consist in three main changes—softening of the wood, bringing the color to the surface, and oxidation of the active principle. The term "fermentation" seemed a misnomer, since organized ferments cannot be credited with any essential action, for the process goes on unimpeded in the presence of antiseptics. "Fermented chips" did at one time constitute an important dyeware and are still considered essential for some rather special dyeing processes, but they have now been largely replaced by oxidized extracts, known as hematine pastes or hematine crystals.

The two main methods of extraction, known respectively as the French and the American, were explained, and the course of the decoctions through the concentrating apparatus was followed to its end in extracts, pastes, solids and dry crystals of logwood, and corresponding products in case of fustic and quercitron. Specimens of these different products were exhibited, together with samples of the active principles, such as hæmatoxylin, hæmatein, both crystalline and colloidal, maclurin, morin, morin white, quercitrin and quercetin, and a considerable list of the synthetic derivatives of hæmatoxylin. Laboratory dyeings of these were shown, as also of the yellows from osage orange and young fustic, the reds from Brazil woods and those from camwood and red sanders. Incidentally it was shown that fustic, and especially morin itself, will dye direct upon white wool and cotton, giving good full shades.

Under the third head, practical dyeings were shown in some variety, of blacks, yellows and greens upon woolens and worsteds, wool rawstock, cotton pieces, leather and silk. The weighting and plumping effects of the natural colors were mentioned, those dyes showing an advantage in this respect over synthetic colors, whether used on wool, cotton, leather or silk. The weighting of silk especially is accomplished better this way than in any other, and is largely practised at all the great silk centres of Europe. A variety of colors were shown on chrome-tanned morocco, running from a jet black to a bright yellow, all from wood dyes. The importance of these colors in the glove industry was mentioned.

The lecturer ended with the exhibition of herbarium sheets of some dyewoods in flower and fruit, cross-sections of logs, microscopical mounts of crystalline hæmatine, both opaque and transparent, and a number of lantern slides of the Jamaica logwood region, including photographs of growing logwood trees.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE QUARTERLY MEETING.

The quarterly meeting of the College was held on December 26th at 4 P.M. in the Library, President French in the chair. Seventeen members were present. The minutes of the semi-annual meeting held September 25th were read and approved. The minutes of the Board of Trustees for September 5th, October 3d and November 7th were read by the Registrar, and approved. A letter was received from Mrs. Susan Ridgway Procter, widow of our late fellow member, Wallace Procter, acknowledging the receipt of the engrossed memorial resolutions recently adopted by the College.

Letters were received from Professor Edgar F. Smith, Provost of the University of Pennsylvania, and Professor Oscar Oldberg, late of Northwestern University School of Pharmacy, Chicago. acknowledging receipt of notices of having been elected to Honorary Membership.

Mr. Meirs Busch offered the following preamble and resolution:

Whereas, The publication by the daily newspapers of the names of the poisons used in cases of suicide or homicide, together with information concerning such poisons and the amount constituting a fatal dose has the tendency to suggest their use to criminals and persons of suicidal intent. Therefore be it

Resolved, That we recommend that the members of the Philadelphia College of Pharmacy request the proprietors of newspapers in their vicinity to omit in future the publication of these details.

The resolution was discussed by Professors Kraemer, Sadtler, and Lowe, and Messrs. Lee, Poley, Boring and President French. Most of the speakers believed that others were induced, either by suggestion or weak mentality to use these poisons for suicidal or homicidal purposes, by reading the details that are usually so fully published in the newspapers. Professor Kraemer said that while the passing of resolutions of this kind might do some good, still the problem is a complex one, and that he believed in addition, some concentrated effort should be undertaken to improve the business and social relations of men which tend to despondency and despair at certain times. The resolution was unanimously adopted.

Mr. J. A. Heintzelman, through Professor Kraemer presented to the College a number of druggist's journals and other reading matter for the use of students.

Professor Kraemer presented the original notes of Professor Maisch in connection with his studies on *Polygala Alba,* during the years 1889 to 1892 inclusive. Considerable discussion and correspondence was carried on by a number of the leading botanists of the country concerning the identity of this root, the memory of which still lingers. The papers were accepted for preservation in the historical collection of the College. Professor Kraemer also presented, for preservation, a letter written by the late Professor William M. Searby, of California.

The Committee on Necrology reported the death of Dr. Walter Wyman, Surgeon-General of the United States Public Health and Marine-Hospital Service, and an Honorary Member of the College. A portrait and extended notice of Dr. Wyman is published in the American Journal of Pharmacy, Vol. 84, No. 1. The President appointed the following Committee on Legislation, Joseph P. Remington, Chairman, William McIntyre, Warren H. Poley, Theodore Campbell, William E. Lee, and William L. Cliffe.

C. A. Weidemann, M.D.,
Recording Secretary.

ABSTRACTS FROM MINUTES OF BOARD OF TRUSTEES.

October 3rd.—Seventeen members were present. A communication was received from the Secretary of the College reporting the election of George M. Beringer, Joseph W. England and C. Mahlon Kline to membership in the Board of Trustees for the ensuing three years.

The Committee on Accounts and Audits reported having examined the accounts of the Treasurer, Registrar and Committee of Publication and found them correct.

The Committee on Instruction made a detailed report, with a number of recommendations which were adopted, as follows:

1st. Course of Special Lectures, as an adjunct to the regular Course.

2d. Course in Pharmaceutical Journalism.

3d. Record of Attendance.

4th. Assistant to the Dean, and that Professor F. X. Moerk be elected to the position.

5th. Duties of the Assistant to the Dean outlined.

6th. Office for the Dean.

7th. Committee on Property empowered to take such steps as necessary to carry out the sixth recommendation; also to have the seats in lecture room re-numbered.

Committee on Scholarships reported the names of ten awards to the various scholarships, which were approved by the Board. After discussion a special committee of five was appointed to report upon a fixed plan and basis for the award of every scholarship.

A communication was received from the Board of Public Education giving the names of students who had been granted scholarships in the Philadelphia College of Pharmacy, as follows: Charles A. Flottman, Central High School; William R. Frank, Central Manual Training School; Meyer E. Epstein, Southern Manual Training School; and one from the Northeast Manual Training School, who declined the appointment. The awards were approved and the Secretary was requested to notify the Secretary of the Board of Education.

November 8th.—Thirteen members were present. Committee on Property reported an estimate for re-numbering the seats in the Lecture rooms; a porcelain number—black figures on white ground—was deemed most desirable.

Committee on Library reported that three hundred and seventeen books had been classified and shelf listed during October; sixty-two persons had used the Library; and quite a number of books had been donated.

Committee on Scholarships reported the name of Alvin Webb of Pitman, N. J. as having passed first in the competitive examination for the Edward T. Dobbins Scholarship, and recommended the award to him. So ordered.

Professor Sadtler stated that the Department of Chemistry was the recipient of a gift of one hundred dollars from W. H. Weiss, class of 1896, who presented this in the name of his class. It was suggested to purchase with this money an Electric Projecting Lantern, which to install would add some additional expense, but it was thought the many advantages of the Lantern would prove of value to the College. The Committee on Property were requested to assist in installing the Lantern.

December 5th.—Seventeen members present. Committee on Property reported that the electric work necessary to install the Lantern in the Chemical Lecture room had been completed and was awaiting inspection.

Committee on Library reported that the total number of books classified, accessioned, shelf-listed and ready for cataloguing was two thousand and eighty-eight; a number of books had been purchased, and forty persons had used the Library.

Committee on Instruction reported that the records of attendance of the students were being noted and a monthly report had been tabulated. The subject of preliminary education and the requirements for entrance to the pharmacy course have occupied the attention of the Committee to a considerable extent this year. The examinations of pharmacy students and the valuation of certificates of preliminary education offered by matriculants, is now under the control of the State Board of Education, and Mr. A. Davis Jackson has been appointed as examiner for pharmacy students.

The Dean stated that Professor Moerk had given much thought to the subject of recording the career of every student in the College and had prepared a very systematic method that would give the standing of each student for the entire three years' course, making the record in each case more readily accessible. The idea met with general approval and on motion the expenditures necessary to carry out the proposed plan were allowed.

Committee on Examination reported that Miss Aase Teisen had complied with all the requirements of the College and satisfactorily passed the examination for the Certificate of Proficiency in Chemistry and was entitled to receive the same. On motion the Certificate was awarded to her.

Committee on Announcement reported in detail in reference to publishing the " Bulletin " during the past year, making comparison with the Alumni Report regarding the expenses incurred, and the advantages of the present arrangement.

Committee on Commencement reported that Mr. French had received a letter from Governor Tener accepting an invitation to be present at the Commencement exercises May, 1912.

A communication was received from Joseph Huntington, Class of 1898, requesting a duplicate of the Robinson Gold Medal, he having lost the one awarded him at his graduation. After discussion, it was voted to grant the request upon satisfactory proof submitted by affidavit of the loss of the original gold medal.

Mr. French stated that he had received a communication from the Secretary of the Academy of Fine Arts requesting the Board of Trustees to allow the removal of his portrait to the Academy for exhibition, the Academy to guarantee proper care of it. The request was granted.

C. A. Weidemann,
Recording Secretary.

PHARMACEUTICAL MEETING.

The Fourth Meeting of the course was an enthusiastic one, the attendance of the student body being good, with a sprinkling of Alumni. Mr. Warren H. Poley presided. Edgar H. Sparks, Ph.G., of Burlington, presented a paper on "Sunday Rest and Shorter Hours of Labor for Pharmacists" in which he reviewed the progress of the movement, citing the resolutions adopted the past year by the various pharmaceutical organizations. This paper will be published in a later issue of this JOURNAL.

Prof. Clement B. Lowe presented a paper "On Shorter Hours for Pharmacists." Quite a number of the students present spoke earnestly and well on the subject, one from Maryland specially urging legislation by which the working hours of the clerk should be reduced to sixty per week, as is at present the law in California. The matter was then further discussed by Messrs. Osterlund, Boring and J. W. England, the latter offering the annexed resolutions which were enthusiastically adopted.

Whereas, One of the most serious evils of the retail drug business to-day is its unnecessarily long hours of work, and

Whereas, There is no real public need for the sixteen hour working day that obtains, especially on Sundays, and

Whereas, We believe that the public, if properly advised of the facts, will be in favor of shorter hours of work for the retail druggist, just as it has been for shorter hours in other lines, especially if it be understood that a reduction of hours means a safer and better service in the handling of drugs and poisons for the sick, therefore be it

Resolved, That the Pharmaceutical Meeting of the Philadelphia College of Pharmacy earnestly urges retail druggists to close their stores on Sundays, partly or wholly, and to close earlier in week days, when and where possible.

The question of earlier closing is preëminently an individual one; each druggist must decide it for himself according to individual conditions. The working conditions in all occupations are rapidly changing and we earnestly urge retail druggists to close every Sunday afternoon, at least. Earlier closing would improve the pharmaceutical service to the public, and do more for the uplifting of pharmaceutical practice than any other single factor; and it would add years to the lives of retail druggists.

Resolved, That a copy of these resolutions be sent to the press.

C. B. L.

FÉDÉRATION INTERNATIONALE PHARMACEUTIQUE.

On the 21st June in the Audience Hall of the Home office at the Hague, a meeting was held of the provisional Committee appointed by the Brussels Congress for the foundation of an International federation.

The following were present: From Belgium DR. A. SCHAMELHOUT, O. VAN SCHOOR and F. DAMINET, from Denmark W. J. MÖLLER, from England E. WHITE and from Holland R. SCHOEPP and J. J. HOFMAN.

The President M. L. Q. V. LEDDEN HULSEROSCH being prevented by illness, the meeting was presided over by MR. SCHOEPP.

The other foreign members of the committee had sent in written information and comments on the draft rules. The Secretary informs the meeting that the Board had at once set to work and thanks to the financial support from the Dutch Government had started its Bureau at the Hague.

Besides the members nominated at the congress, representatives of other nationalities had also been invited to coöperate. Thanks to this coöperation the Bureau now has at its disposal a list of societies and associations in Argentine, Austria, Belgium, Bosnia, Bulgaria, Finland, France, Great Britain, Greece, Hungary, Italy, Japan, Luxemburg. Montenegro, Norway, the Netherlands, Portugal, Poland, Rumania, Russia, Servia, Spain, Sweden, Turkey and the Transvaal and continues adding to these data.

Several societies have already promised their coöperation and in principle decided to become members of the Federation.

The Bureau is corresponding with several of these societies. The draft rules are ready and have been sent to the members of the committee, to different papers and to societies interested in the subject.

The meeting was called in order to compare the rules, as drafted with the comments and remarks received from various sides and if necessary to amend them. The meeting then had to approve them and in the name of the provisional committee send them to the societies. The remarks received were discussed and the discussion proved that on the whole the rules as drafted received the general approval. The most important amendment accepted, was to the effect that the Federation, whose chief object is to be a centre for the scientific and professional interests of Pharmacy, should also promote the international regulation of the sale of specialties and will try to exercise influence on international commercial treaties and on the regulations as to patents and trade marks.

An alteration was also made in the subscriptions, in order to meet the objection of very large societies against a contribution per member. It was decided that every national society on the basis of their membership should have the right to nominate a certain number of delegates to the central committee of the federation and that the contribution should then be frs. 100 per delegate. The number of delegates varies between 1 and 8, the contribution of the national societies will consequently be from fr. 100 to fr. 800. It was decided that international congresses should have their own organization, in consultation however, with the Board of the Federation.

After these alterations had been discussed and decided upon, the draft was approved and will now, in accordance with the resolution of the Brussels Congress shortly be sent to the National Societies with a report of the provisional committee.

These societies will be invited to become members of the Federation subject to acceptance of these rules.

The official foundation of the federation will then take place in 1912, the provisional committee will resign, and the central committee nominated by the national societies will be inaugurated and be invited to nominate a Board.

This new Board will then have to decide in consultation with the affiliated societies, what further steps may be necessary for regulating the federation, it will have to draft regulations for the international Congresses and it will further have to continue the work of the provisional committee in connection with the objects of the International federation.

The Bureau of the committee intends publishing a Bulletin, the first number of which will appear in 1912 and will give a list of all pharmaceutical societies, with the names of the members of the Board, object, etc., etc. A list will also be given of all pharmaceutical periodicals in the world.

In order to make these lists as accurate and complete as possible the Bureau requests the Secretaries of the Pharmaceutical Societies of the world to send in a copy of their rules and the names of the present members of their Boards.

The Edition of Pharmaceutical Journals are also requested to send a copy of their paper to the Secretary: 4 Schwenkweg, The Hague.

NOTES AND NEWS.

PRESENTATION TO PROFESSOR CASPARI.—On December 26th, 1911, a notable gathering of pharmacists assembled in the Hotel Stafford to witness the presentation by Professor Joseph P. Remington of a series of resolutions, adopted by the American Pharmaceutical Association, testifying to the services of Professor Charles Caspari, Jr., to American pharmacy. There were present on this occasion in addition to Professor Caspari and Professor Remington, Dr. John F. Hancock and his son James, Professor William Simon, Dr. D. M. R. Culbreth, Dr. Charles E. Caspari, Mr. J. B. Thomas, Dr. A. R. L. Dohme, and others. After the presentation of the resolutions, Professor Caspari was surprised when Professor Remington presented him in addition with a gold watch and fob, being a gift of his pharmaceutical friends in appreciation of his 17 years of devoted service as General Secretary of the American Pharmaceutical Association. After the presentations the company adjourned to the dining hall of the Stafford and partook of suitable refreshments. Professor Caspari expressed himself feelingly in relation to the presentations and the company departed after greeting each other with the compliments of the Christmas season.

MERCK'S ANNUAL REPORT for 1910 has recently been issued. It contains much valuable information concerning recent advances in pharmaceutical chemistry and therapeutics. It is a year-book of very great interest. The present volume contains excellent monographs on the cacodylates and their therapeutic uses, on kephir and important preparations and drugs.

ANALYTICAL REPORT OF SMITH, KLINE AND FRENCH CO. The present report contains a summary of the work accomplished in the analytical department of this firm during the past three years. The results of the analyses of crude drugs and chemicals show that analytical examinations continue to be necessary not so much for the purpose of detecting adulteration, as there is far less adulteration to-day than formerly, but in order that the quantitative value of drugs and preparations may be ascertained.

THE AMERICAN
JOURNAL OF PHARMACY

MARCH, 1912

THE HEART TONIC UNIT.

By H. C. Hamilton, M.S.

From the Research Laboratory of Parke, Davis & Co., Detroit, Mich.

It is a fact universally recognized by those concerned in the manufacture and standardization of drug extracts, that the crude drugs from which they are obtained vary widely in their content of active constituents. This variation can be adjusted readily when the active constituent is of such a nature as to be assayed by chemical process. This, however, with our present knowledge, is impossible to apply to a number of the very important drugs. It is particularly true of the Digitalis series of Heart Tonics.

In 1898, Dr. Houghton (*Journal of the American Medical Association*) called attention to a method by which this important series of drugs could be standardized with considerable accuracy. It involved the use of frogs, and depends upon the toxicity of the drug to these animals. That method greatly amplified and improved, was proposed at the Seventh International Congress of Applied Chemistry at London (*Lancet,* June 18, 1909) as a method which could be readily applied for the standardization of the cardiac tonics, by which that uniformity could be obtained in the activity of these preparations so essential to their therapeutic application.

Pharmacologists have very generally agreed that the cold-blooded animals and especially frogs are much better adapted to the standardization of the cardiac tonics than the warm-blooded animals, because the latter die from paralysis of respiration, while in the frog respiration through the skin will compensate for this paralysis and the cause of death is due entirely to the action of these drugs directly on the heart. This agreement, as to the animal to be used, does not, however, extend to the method. There are three methods in use by different pharmacologists, that used in Europe being one suggested by Focke, of Dusseldorf (*Archiv. der Pharmazie,* Band 248, Heft 5, p. 5345). By this method, which is a modification of that of Houghton, a value V is obtained by taking into account not only the weight and dose, but also the time necessary to kill the frog. The method is not difficult to follow, but the results obtained seem not to have the accuracy of those obtained by the original method, as demonstrated by Houghton. The words of Focke, the author of this modification, probably describe it with fair accuracy as follows: "From the collected evidence it may be seen that the Short Time Method of physiological Digitalis and Strophanthus testing is indeed not free from difficulties and, therefore, requires care as well as practice, that it, however, satisfied pharmacological demands and all practical requirements in an advantageous manner, besides being easily understood and not inhuman."

American investigators have, however, more generally adopted, either the method of Houghton or a modification of it, suggested by Cushny. The latter determines the dose necessary to stop the laid bare frog's heart in systole in exactly one hour. It is described by Edmunds, Bulletin No. 48, P. H. & M. H. Laboratory.

The original method of Houghton slightly modified and later presented at the Los Angeles meeting of the American Pharmaceutical Association (Houghton & Hamilton, AMERICAN JOURNAL OF PHARMACY, October, 1909), included also a means by which the activity could be indicated on the label. This constituted a distinct advance over any method previously used for indicating the value of such drugs. It is in short, the adoption of a Heart Tonic Unit and the statement that the unit quantity—1 c.c. or 1 gram—of the substance contains a certain number of H.T.U.'s.

The Heart Tonic Unit is derived from the Minimum Lethal Dose, a factor which is obtained by determining the toxicity to frogs of any member of the digitalis series of heart tonics.

The method of Houghton, described in detail in the AMERICAN JOURNAL OF PHARMACY, referred to above, specifies certain conditions as being essential to its successful application. It consists in brief in the determination of the M.L.D. by injecting several series of frogs with varying quantities of the solution properly diluted, using a sufficient number of frogs to obtain the smallest dose which is fatal to a majority of the frogs used. On account of the variation in the resistance of frogs at different seasons of the year, and under different conditions of temperature and atmospheric changes, a standard product is also to be tested on a series of frogs run parallel to those under test for the sample. Twelve hours or more are allowed to elapse before the results are read from each series of tests. When a sufficient number of series of tests have been made, to determine with accuracy the toxicity of both sample and standard to these frogs, the activity of the sample in question can be stated in terms of the standard. If the sample being standardized has the same M.L.D. as that of the standard, its activity is 100 per cent.; if its M.L.D. is greater or less than that of standard its activity is the inverse ratio of the M.L.D.'s of sample and of standard. For example, if the M.L.D. of a Tincture of Strophanthus is .00010, while that of the standard tincture is .00015, its activity compared to standard is the ratio of .00015 to .00010, or 1½, and its percentage of activity is 150. A more convenient way is that where its activity is expressed in Heart Tonic Units.

A Heart Tonic Unit is ten times the minimum lethal dose of the standard for each of the members of the digitalis series determined as above, when the frogs are of normal resistance. The number of H.T.U. per cubic centimetre in the sample so tested is the reciprocal of one Heart Tonic Unit.

Table I gives the M.L.D. and H.T.U. per cubic centimetre for each of the official preparations of the digitalis series of heart tonics when of standard activity.

TABLE I.

	M. L. D.	Exact No. of H. T. U. per c.c.	No. of H. T. U. in round numbers per c.c.
Digitalis—Fluid Extract, U.S.P., 1890	.0015	66	65
Solid Extract	.0005	200	200
Tincture, U.S.P., 1900	.015	6	6
Digitalin (Germanic)	.00005	2000	2000
Squill—Fluid Extract, U.S.P., 1890	.0012	83	80
Strophanthus—Tincture, U.S.P., 1900	.000075	1300	1300
Convallaria—Fluid Extract:			
Rhizome and roots, U.S.P.	.00025	400	400
Herb	.00015	666	650
Flowers	.00009	1111	1100

On account of the variation in the toxicity of the standard and of the different preparations belonging to this series, due to changes in the resistance of frogs, as noted above, it becomes a matter of considerable importance, as well as convenience to have a table to which one can refer and readily deduce the number of H.T.U.

of any preparation after obtaining its M.L.D. The number of H.T.U. in any given preparation is the reciprocal of 10 times the M.L.D. if the frogs are of normal resistance. The resistance of frogs, however, varies greatly, and for this reason the number of H.T.U. per cubic centimetre can evidently not be obtained in so simple a manner.

The factor to be used for adjusting its value is the ratio between the M.L.D. of the standard selected and its average M.L.D. The formula would, therefore, be

$$\frac{1}{10 \times \text{M.L.D. of Sample}} \times \frac{\text{M.L.D. of Standard}}{\text{Average M.L.D. of Standard}}$$

= H.T.U per c.c. or gm. By means of this formula the correctness of any number in the table may readily be verified.

In Table II the numbers in the first horizontal column are the M.L.D. of standard Tincture Strophanthus, U.S.P., 1890, the range of doses being such as to cover the variation in its toxicity to frogs during the different seasons of the year.

The eight horizontal columns of numbers following this are the M.L.D. for each preparation of the series, with the same range in toxicities as for the Tincture mentioned first.

The numbers in the first vertical column beginning with .010 are M.L.D. of samples. In this column will be found every possible M.L.D. of members of this series by merely adjusting the decimal point.

All the other numbers in columns A to I inclusive and below the double line are H.T.U. per cubic centimetre or per gramme of preparations of the digitalis series of heart tonics, any particular number being the value in terms of Heart Tonic Units of a sample whose M.L.D. is at the head of the horizontal column and the M.L.D. of the standard is in the vertical column which intersects the horizontal at that number.

For example, if a Tincture of Digitalis has a M.L.D. of .020 while that of the standard Tincture Digitalis is .012, it contains 4 H.T.U. per cubic centimetre, this number being found where the columns headed D and .020 intersect.

The number representing the H.T.U. of any preparation having an M.L.D. from .010 to .099 may be found in this way, while those of greater toxicity may be obtained by using a multiple of the number given. For example, if a sample of F.E. Digitalis has the M.L.D. .0020 while that of the standard F. E. Digitalis is .0012, the sample contains 40 H.T.U. since its toxicity is ten times that used in the first illustration.

It is evident therefore, that with the data obtained from the assay on frogs one may find in the table the Heart Tonic Units accurately determined for any degree of toxicity.

In a laboratory where samples of every preparation of this series may come in for assay at one time it is inconvenient and, as one can readily see, unnecessary to have an assay of the corresponding standard for each one, since the only object of testing the standard in comparison with the sample is to determine the resistance of the frogs. For this purpose therefore in an emergency any one of the preparations might be used as the standard, because a change in the resistance of the frogs would bring about a proportionate change in the M.L.D. of all the standards. Whatever standard is adopted, however, should be a product least subject to changes in its activity from any cause. Pure crystalline Kombé Strophanthin is the one which seems to meet all the requirements. This product was finally selected and reported at a meeting of the Philadelphia Section of the American Pharmaceutical Association in March, 1911 (Houghton, *American Druggist*, July 24, Sept. 11th).

The ninth horizontal column of numbers representing M.L.D. of standard preparations of the digitalis series of heart tonics are those for Kombé Strophanthin. These are enclosed between heavy lines. Kombé Strophanthin contains 100,000 H.T.U. per gram, therefore, when this substance is used as the standard the number of H.T.U. in any sample being tested can be calculated by a simpler formula which is obtained by substituting constants in the one previously given and is merely a rearrangement of it. The formula then becomes

$$\frac{100{,}000 \times \text{M.L.D. Strophanthin}}{\text{M.L.D of Sample}} = \text{H T.U. per c.c. or gm.}$$

which can be used at any time in place of the table. The numbers in the table, however, are accurately calculated, and when available are much more convenient than to make the computation in each case.

TABLE II.

	A	B	C	D	E	F	G	H	I
Tr. Strophanthus, U. S. P. 1890.	.00009	.0001	.00011	.00012	.00013	.00014	**.00015**	.00016	.00017
Tr. Strophanthus, U. S. P. 1900.	.000045	.00005	.000055	.000060	.000065	.00007	**.000075**	.000080	.000085
F. E. Digitalis (70% alcohol)	.0009	.0010	.0011	.0012	.0013	.0014	**.0015**	.0016	.0017
S. E. Digitalis......	.00030	.00033	.00037	.0004	.00043	.00047	**.0005**	.00053	.00057
Tr. Digitalis.......	.009	.010	.011	.012	.013	.014	**.015**	.016	.017
Digitalin..........	.00003	.000033	.000037	.00004	.000043	.000047	**.00005**	.000053	.000057
F. E. Squill, U. S. P. 1890.	.00072	.0008	.00088	.00096	.00104	.00112	**.0012**	.00128	.00136
F. E. Convallaria, U. S. P.	.00015	.00017	.00018	.00020	.00022	.00023	**.00025**	.00027	.00028
Strophanthin.	.0000006	.00000066	.00000073	.0000008	.00000086	.00000093	**.000001**	.00000106	.00000113

M. L. D. of Samples.	A	B	C	D	E	F	G	H	1
.010	6.000	6.667	7.333	8.	8.667	9.333	10.	10.667	11.333
.011	5.454	6.061	6.667	7.273	7.879	8.485	9.091	9.697	10.303
.012	5.000	5.555	6.111	6.667	7.222	7.778	8.333	8.889	9.444
.013	4.615	5.128	5.641	6.154	6.667	7.179	7.692	8.205	8.718
.014	4.286	4.762	5.238	5.714	6.190	6.667	7.143	7.619	8.095
.015	4.000	4.444	4.889	5.333	5.778	6.222	6.667	7.111	7.556
.016	3.750	4.166	4.583	5.000	5.417	5.833	6.250	6.667	7.083
.017	3.529	3.921	4.314	4.706	5.008	5.490	5.882	6.275	6.667
.018	3.333	3.704	4.074	4.444	4.814	5.184	5.555	5.926	6.296
.019	3.158	3.508	3.860	4.211	4.561	4.912	5.263	5.614	5.965
.020	3.	3.333	3.667	4.000	4.333	4.667	5.	5.333	5.667
.021	2.857	3.175	3.492	3.810	4.127	4.444	4.762	5.079	5.397
.022	2.727	3.030	3.333	3.636	3.939	4.242	4.545	4.848	5.151
.023	2.609	2.899	3.188	3.478	3.768	4.058	4.348	4.638	4.927
.024	2.500	2.778	3.056	3.333	3.611	3.889	4.167	4.444	4.722
.025	2.400	2.667	2.933	3.200	3.467	3.733	4.	4.267	4.533
.026	2.307	2.564	2.820	3.077	3.333	3.589	3.846	4.102	4.359
.027	2.222	2.469	2.716	2.963	3.210	3.457	3.703	3.951	4.197
.028	2.143	2.381	2.619	2.857	3.095	3.333	3.572	3.810	4.047
.029	2.069	2.300	2.529	2.759	2.988	3.218	3.448	3.678	3.908
.030	2.000	2.222	2.444	2.667	2.889	3.111	3.333	3.555	3.778
.031	1.935	2.151	2.366	2.581	2.796	3.011	3.226	3.441	3.656
.032	1.875	2.083	2.292	2.500	2.709	2.917	3.125	3.333	3.541
.033	1.818	2.020	2.222	2.424	2.626	2.828	3.030	3.232	3.434
.034	1.765	1.960	2.157	2.353	2.549	2.745	2.941	3.137	3.333
.035	1.714	1.905	2.095	2.286	2.476	2.667	2.857	3.048	3.238
.036	1.667	1.852	2.037	2.222	2.407	2.592	2.778	2.963	3.148
.037	1.621	1.802	1.982	2.162	2.342	2.523	2.703	2.883	3.063
.038	1.579	1.754	1.930	2.105	2.281	2.456	2.632	2.807	2.982
.039	1.538	1.710	1.880	2.051	2.222	2.393	2.564	2.735	2.906
.040	1.500	1.667	1.833	2.000	2.167	2.333	2.500	2.667	2.833
.041	1.463	1.626	1.789	1.951	2.114	2.276	2.439	2.602	2.764
.042	1.429	1.587	1.746	1.905	2.064	2.222	2.381	2.540	2.698
.043	1.396	1.550	1.705	1.860	2.016	2.170	2.326	2.481	2.636
.044	1.363	1.515	1.667	1.818	1.969	2.121	2.272	2.424	2.575
.045	1.333	1.481	1.630	1.778	1.926	2.074	2.222	2.370	2.518

TABLE II—*Continued.*

M. L. D. of Samples.	A	B	C	D	E	F	G	H	I
.046	1.304	1.449	1.594	1.739	1.884	2.029	2.174	2.319	2.463
.047	1.277	1.418	1.560	1.702	1.844	1.986	2.128	2.270	2.411
.048	1.250	1.390	1.528	1.667	1.806	1.944	2.083	2.222	2.361
.049	1.224	1.360	1.497	1.633	1.768	1.905	2.041	2.177	2.313
.050	1.200	1.333	1.467	1.600	1.733	1.867	2.000	2.133	2.266
.051	1.176	1.307	1.438	1.569	1.699	1.830	1.961	2.091	2.222
.052	1.153	1.282	1.410	1.538	1.667	1.795	1.923	2.051	2.179
.053	1.132	1.258	1.384	1.510	1.635	1.761	1.887	2.013	2.138
.054	1.111	1.234	1.358	1.481	1.605	1.728	1.851	1.975	2.098
.055	1.091	1.212	1.333	1.455	1.576	1.697	1.818	1.939	2.060
.056	1.071	1.191	1.310	1.429	1.548	1.667	1.786	1.905	2.024
.057	1.053	1.170	1.287	1.404	1.520	1.637	1.754	1.871	1.988
.058	1.034	1.150	1.264	1.379	1.494	1.609	1.724	1.839	1.954
.059	1.017	1.130	1.243	1.356	1.469	1.582	1.695	1.808	1.921
.060	1.	1.111	1.222	1.333	1.444	1.555	1.667	1.778	1.889
.061	.984	1.093	1.202	1.311	1.421	1.530	1.639	1.749	1.858
.062	.968	1.075	1.183	1.290	1.398	1.505	1.613	1.720	1.828
.063	.952	1.058	1.164	1.270	1.376	1.481	1.587	1.693	1.799
.064	.938	1.042	1.146	1.250	1.354	1.458	1.562	1.667	1.771
.065	.923	1.026	1.128	1.231	1.333	1.436	1.538	1.641	1.744
.066	.909	1.010	1.111	1.212	1.313	1.414	1.515	1.616	1.717
.067	.896	.995	1.095	1.194	1.294	1.393	1.492	1.592	1.691
.068	.882	.980	1.078	1.176	1.274	1.372	1.470	1.568	1.667
.069	.869	.966	1.063	1.159	1.256	1.352	1.449	1.546	1.642
.070	.857	.952	1.048	1.143	1.238	1.333	1.428	1.524	1.619
.071	.845	.939	1.033	1.127	1.221	1.315	1.408	1.502	1.596
.072	.833	.926	1.018	1.111	1.203	1.296	1.388	1.481	1.574
.073	.822	.913	1.005	1.096	1.187	1.278	1.370	1.461	1.552
.074	.810	.901	.991	1.081	1.171	1.261	1.351	1.441	1.531
.075	.800	.889	.978	1.067	1.156	1.244	1.333	1.422	1.511
.076	.789	.877	.965	1.053	1.140	1.228	1.316	1.403	1.491
.077	.779	.866	.952	1.039	1.125	1.212	1.300	1.385	1.472
.078	.770	.855	.940	1.026	1.111	1.196	1.282	1.368	1.453
.079	.759	.844	.928	1.013	1.097	1.181	1.266	1.350	1.435
.080	.750	.833	.917	1.000	1.083	1.167	1.250	1.333	1.417
.081	.741	.823	.905	.988	1.070	1.152	1.235	1.317	1.399
.082	.732	.813	.894	.976	1.057	1.138	1.220	1.301	1.382
.083	.723	.803	.884	.964	1.044	1.124	1.205	1.285	1.365
.084	.714	.793	.873	.952	1.032	1.111	1.190	1.270	1.349
.085	.706	.784	.863	.941	1.020	1.098	1.176	1.255	1.333
.086	.698	.775	.853	.930	1.008	1.085	1.163	1.240	1.318
.087	.690	.766	.843	.920	.996	1.073	1.149	1.226	1.303
.088	.682	.757	.833	.909	.985	1.060	1.136	1.212	1.288
.089	.674	.749	.824	.900	.974	1.049	1.124	1.198	1.273
.090	.667	.741	.815	.889	.963	1.037	1.111	1.185	1.259
.091	.659	.733	.806	.879	.952	1.026	1.099	1.172	1.245
.092	.652	.725	.797	.870	.942	1.015	1.087	1.160	1.232
.093	.645	.717	789	.860	.931	1.004	1.075	1.147	1.219
.094	.638	.709	.780	.851	.922	.993	1.064	1.135	1.206
.095	.632	.702	772	.842	.912	.982	1.053	1.123	1.193
.096	.625	.694	.764	.833	.903	.972	1.042	1.111	1.180
.097	.619	.687	.756	.825	.893	.962	1.031	1.099	1.168
.098	.612	.680	748	.816	.884	.952	1.020	1.088	1.156
.099	.606	.673	.741	808	.875	943	1.010	1.077	1 145

THE NAMING OF CARBON COMPOUNDS.

A Dictionary of the Prefixes, Suffixes and other Syllables as well as Letters and Signs Used in the Naming of Carbon Compounds.

By

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PREFACE.

The difficulties in the way of devising a rational and comprehensive system for the naming of carbon compounds and the widely divergent views held by authors and teachers in regard to the system to be adopted, makes it improbable that any one system will come into general use—at least not for a long time to come. Nevertheless, the need and advantage of uniformity and rationalism are so obvious that I have always felt it my duty to do what I could to encourage the correct and uniform naming of chemical compounds. In line with this I published some years ago, in the *Pharmaceutical Review,* a register of the prefixes, endings, etc., used in the naming of carbon compounds, paying particular attention to the system adopted by the Congress held, for this purpose, in Geneva, Switzerland, in 1902.

Inquiries, which have come to me as Secretary of the Council on Pharmacy and Chemistry, regarding the system used for names of organic compounds in New and Non-official Remedies, have made it appear desirable to publish at this time a more extended register for the benefit of teachers, particularly those in schools of medicine and pharmacy who treat of organic compounds, and as a convenient means of reference for physicians and pharmacists in general.

It has been thought desirable to include in this list all syllables, prefixes and suffixes which are in general use in the naming of carbon compounds, but no attempt has been made to make the list complete. The names of parent compounds such as benzene, naphthalene, quinoline, etc., are not considered within the scope of this treatise and have been omitted except in those cases where it was desired to refer to the naming of their derivatives in the

Appendix. In accord with growing preference, the assumed form of combination or linkage, where considered desirable, has been indicated by means of dots, instead of dashes. In general the dots have reference to the combination or linkage of carbon atoms, thus in $CH_3.CH(CH_3).CH:CH_2$ the dots indicate the nature of the linkage of the carbon atoms of the chain.

While the origin of the terms used and also the warrant for their use would be highly interesting, it was not deemed advisable to increase the size of the work by including such references. Further, while the author may have, or probably has, decided preferences, he has not attempted to lay down rules for the adoption of any particular system of nomenclature, but instead has attempted to give definitions for all the terms in common use without preferences.

At this time I wish to express appreciation to my colleagues who were kind enough to examine the first publication and to suggest corrections and additions. Also to those who have consented to examine the proofs of the present publication, particularly my associates, W. S. Hilpert and L. E. Warren.

A

a An abbreviation for *asymmetric* (which see).

a An abbreviation for *ana* (which see).

α Alpha, the first letter of the Greek alphabet (see Appendix H).

α An abbreviation for *anti* (which see).

Ac A prefix derived from *alicyclic* (which see). Also used to indicate the acetyl group, $(CH_3.CO)'$; thus AcH is acetaldehyde, CH_3COH.

acet A prefix showing relation to acetic acid, CH_3COOH, either in structure as in *acetanilide* $C_6H_5NH(CH_3CO)$ or by derivation as in *acetaldehyde* $CH_3.CHO$.

acetin An acetic acid ester of glycerol. *Monacetin* is $C_3H_5(OH)_2(CH_3COO)$, *diacetin* is $C_3H_5(OH)(CH_3COO)_2$ and *triacetin* is $C_3H_5(CH_3COO)_3$.

aceto The same as *acet* (which see).

acetonyl The radical $(CH_3.CO.CH_2)'$ derived from acetone, $CH_3.CO.CH_3$.

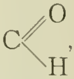
acetyl The radical $(CH_3.CO)'$ derived from acetic acid, $CH_3.COOH$.

acid Organic acids in general are compounds containing one or more carboxyl groups (see *carboxyl* and Appendix G). In some cases the hydroxyl group when associated with certain strongly negative groups imparts acid properties to a compound. Thus trinitrophenol $C_6H_2(NO_2)_3OH$, is a substance having the properties of a strong acid and is known as picric *acid*.

acidamide Synonymous with *amide* (which see).

acridyl Compounds derived from acridine, thus the aldehyde $C_{13}H_9N.CHO$ obtained by the oxidation of methyl-acridine, $C_{13}H_9N.CH_3$, is commonly called *acridyl aldehyde.*

acyl An acyl group is the residue obtained by taking hydroxyl from an organic acid, thus OH taken from acetic acid, $CH_3.COOH$ leaves the acyl group $CH_3.CO'$.

al The ending *al* indicates an aldehyde, that is the group  $C\begin{matrix}\diagup O\\ \diagdown H\end{matrix}$, usually written—CHO, thus $CH_3.CHO$ is *ethanal*, $CH_3.CH_2.CHO$ is *propanal* (see Appendix G). Exceptions: *methylal* $HCH(OCH_3)_2$ is a compound derived from methyl alcohol (methanol) and *formaldehyde* (*methanal*), $2CH_3OH + HCHO = HCH(OCH_3)_2 + H_2O$. *Acetal*, $CH_3.CH(OC_2H_5)_2$, is derived from ethyl alcohol (ethanol) and *acetaldehyde* (*ethanal*) $2C_2H_5OH + CH_3.CHO = CH_3.CH(OC_2H_5)_2 + H_2O$.

alcoholate Just as, for instance, aldehydes combine with water to form hydrates, thus $CCl_3CHO + H_2O = CCl_3.CH(OH)_2$, so aldehydes combine with alcohols to form alcoholates, thus chloral and ordinary alcohol react: $CCl_3.CHO + C_2H_5OH = CCl_3.CH(OH)(OC_2H_5)$. The term alcoholate is also applied to compounds when hydrogen of the hydroxyl of an alcohol is replaced by metallic elements, thus CH_3ONa, C_2H_5ONa, etc.

ali A prefix indicating *aliphatic* (which see).

alicyclic A *cyclic* (which see) compound belonging to the *aliphatic* (which see) series of hydrocarbons.

aliphatic The name aliphatic is derived from a Greek work meaning *oil* and is often applied to the "Open chain hydrocarbons" because the fats and many of their derivatives belong to this group.

alkyl A term applied to univalent hydrocarbon radicals, especially of the aliphatic series, thus: $(CH_3)'$, $(C_2H_5)'$. These radicals may be considered as derived from the corresponding alcohols: CH_3OH, C_2H_5OH, etc., whence the term *alkyl*.

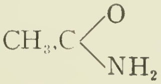
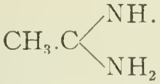
allyl The group $CH_2:CH.CH_2$—; thus propenol, $CH_2:CH.CH_2OH$, is commonly called *allyl* alcohol.

alphyl Univalent aliphatic hydrocarbon radicals: $CH_3—$, $C_2H_5—$, etc. The same as *alkyl* (which see).

amenyl Compounds derived from pentenes (amylenes C_5H_{10}) thus pentenyl benzene $C_6H_5(C_5H_9)$ is termed *amenyl-benzene.*

amid The same as *amide* (which see).

amide The term amide is generally used to indicate compounds obtained by replacing the hydroxyl of an acid by NH_2, thus acetic or ethanoic acid, $CH_3.COOH$, gives ethanamide, $CH_3CO(NH_2)$. Originally the term was applied to all compounds containing the amidogen group, $NH_2—$, and $CH_3(NH_2)$, now called *methylamine* (see *amine*) is still often called *amido-methane* or *methyl-amide.* Similarly $C_6H_5NH_2$, aniline or phenamine, is often called *amido-benzene.*

amidine Amides in which the oxygen has been replaced by an *imide* (which see) group, thus ethanamide,  $CH_3.C\left\langle\begin{matrix}O\\NH_2\end{matrix}\right.$ yields *ethane amidine,*  $CH_3.C\left\langle\begin{matrix}NH.\\NH_2\end{matrix}\right.$

amido The group $NH_2—$. Ethanamide is often called *amido-ethane.*

amin The same as *amine* (which see).

amine Basic compounds formed from alcohols or phenols by replacing OH with NH_2, thus C_2H_5OH yields $C_2H_5NH_2$, *ethane-amine* or *ethyl-amine.*

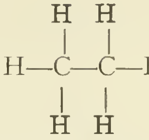
amino The group NH_2 when it replaces OH of an alcohol, thus ethane-amine is also called *amino-ethane.*

amphi A prefix proposed to be used to indicate a symmetric distribution of the side-chains of a cyclic compound or of the atoms of a hetero-cyclic compound. For 1,3— meta- or mi-diazine it is proposed to substitute the term *amphidiazine* (see Appendix J–e).

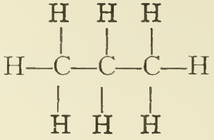
amyl Indicates a hydrocarbon chain of five carbon atoms, thus $C_5H_{11}OH$ is amyl alcohol and C_5H_{10} is amylene.

ana A prefix used in indicating position in quinoline derivatives (see Appendix I) and in naphthalene derivatives (see Appendix J).

ane This ending denotes a saturated hydrocarbon, *i.e.*, a compound in which the carbon atoms are united by single bonds or valencies thus:

ethane 

$$\begin{array}{ccccccc} & & H & & H & & \\ & & | & & | & & \\ H & — & C & — & C & — & H \\ & & | & & | & & \\ & & H & & H & & \end{array}$$

, propane 

$$\begin{array}{ccccccccc} & & H & & H & & H & & \\ & & | & & | & & | & & \\ H & — & C & — & C & — & C & — & H \\ & & | & & | & & | & & \\ & & H & & H & & H & & \end{array}$$

(Appendix A).

anhydride See *anhydro*.

anhydro A prefix used to designate anhydrides or compounds from which water has been abstracted.

anilid Same as *anilide* (which see).

anilide Anilides are derivatives of aniline (benzene-amine, benzamine or phenamine, $C_6H_5NH_2$) in which a hydrogen atom of the NH_2 group has been replaced by an *acyl* (which see) group, thus $C_6H_5NH(CH_3.CO)$ is *acetanilide*.

anisyl A prefix used to indicate derivation from anisol (phenyl methyl ether) $C_6H_5.O.CH_3$. Thus *anisyl oxybutyric acid* is $CH_3O.C_6H_4.CH(OH).CH_2.CH_2.COOH$.

anthra In some chemical terms the prefix refers to derivation from coal as in anthracene. In many terms the prefix denotes derivation from anthracene, thus *anthraquinone* and *anthra-flavic acid*.

anthranil A prefix applied to derivatives of *anthranilic acid* (ortho-aminobenzoic acid $C_6H_4(NH_2)COOH$, 1 : 2), thus *anthranil* is an anhydride of *anthranilic acid* and *anthranil-phenylacetic acid* has the composition $C_6H_3.COOH.NH.CH.(C_6H_5)COOH$.

anti A prefix referring to stereoisomerism, thus the two isomeric benzaldoximes are designated *syn-benzaldoxime*, to indicate that the aldehydic hydrogen is near to the hydroxyl, while in *anti-benzaldoxime* they are farther apart from each other. It has been proposed for general use as a means of indicating the symmetrical distribution of side-chains or of the arrangement of the atoms of a heterocyclic ring. For 1, 4-, para- or pidiazine it is proposed to substitute the term *antidiazine*.

apo A prefix used to show derivation, thus *apomorphine* is derived from morphine.

ar An abbreviation for aromatic. One of the names given to the class of organic compounds which are also known as the closed-chains or benzene series of compounds (compare *aliphatic*).

aralkyl A name, meaning aromatic *alkyl*, applied to monovalent aromatic radicals containing the free valencies in the side-chain, thus benzyl, $C_6H_5CH_2$—.

arsanilate A salt or compound of arsanilic acid. $AsO(C_6H_4NH_2)(OH)_2$, *i.e.*, arsenic acid $AsO(OH)_3$ in which one hydroxyl is replaced by aniline from which one atom of hydrogen has been removed.

arsin An arsin or *arsine* is a compound derived from hydrogen arsenid (arsin, arsine), AsH_3, by replacement of hydrogen with organic radicals. Thus *trimethyl-arsin* or *trimethyl-arsine* is $(CH_3)_3As$ and *methyl-arsin dichloride* is $(CH_3)AsCl_2$. See also *arsinic*.

arsine See *arsin*.

arsinic Derived from, or related to, arsenic acid. Arsinic acids are derived from arsenic acid, $AsO(OH)_3$, by replacement of one or more hydroxyl groups of hydrocarbon radicals, thus *methyl-arsinic acid* is $AsO(CH_3)(OH)_2$ and *diphenyl-arsinic acid* is $AsO(C_6H_5)_2(OH)$. It has also been proposed to restrict the term *arsinic acid* to arsenic acid in which two hydroxyl groups are replaced by hydrocarbon groups.

arson The same as *arsonic* (which see).

arsonate A salt or compound of an *arsonic acid,* thus atoxyl, $C_6H_4(NH_2)(AsO.OH.ONa)$, has been called *sodium anilin-arsonate.*

arsonic Derived from, or related to arsonic acid. Arsonic acids are arsenic acids in which hydroxyl is replaced by a hydrocarbon group, thus *anilin-arsonic acid* is $AsO(C_6H_4NH_2)(OH)_2$.

aryl A name applied to monovalent aromatic groups in which the free valence is in the benzene nucleus.

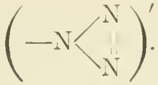
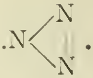
as An abbreviation for *asymmetric* (which see).

ase An ending used to indicate enzymes or ferments, thus *amyloglycase* is an enzyme which acts on starch with formation of glucose.

asym An abbreviation of *asymmetric* which means that groups or side-chains are arranged unsymmetrically, thus 1-, 3-, 4-trichlorbenzene is also designated *asymtrichlorbenzene* (see Appendix B–c).

atomic Refer to *monatomic, diatomic, triatomic.*

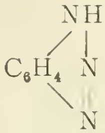
az An abbreviation of azote, meaning nitrogen. Refer to *azo, azoxy,* etc.

azid The group . Thus benzazid is $C_6H_5CO.$

azido The same as *azid* (which see).

azimido The same as *azimino* (which see).

azimino Azo-amino compounds containing three atoms of nitrogen and produced by the action, for instance, of nitrous acid on o-diamines. The composition of *azimino-benzene* is stated to be



azin See *azine.*

azine A name proposed to indicate the "ring" consisting of five carbon atoms and one nitrogen atom, the union being formed by nine "bonds." In a generic sense it has also been proposed for six-atomic "rings" of carbon and nitrogen atoms, united by nine "bonds" (see *diazine, triazine, tetrazine*).

azo The group $—N = N—$, thus *azobenzene* is $C_6H_5N = NC_6H_5$.

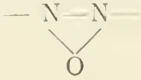
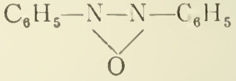
azoin An *azine* (which see) in which one atom of carbon has been replaced by an oxygen atom. The ring consists, therefore, of one oxygen atom, one nitrogen atom and four carbon atoms, the "ring" being formed by nine "bonds."

azol The same as *azole* (which see) which is to be preferred.

azole A name proposed for "rings" of carbon and nitrogen atoms, consisting of five atoms, the "ring" being formed by seven "bonds." Specifically, the ring consisting of one nitrogen and four carbon atoms is termed *azole,* that containing two nitrogen and three carbon atoms *diazole,* etc.

azoxol A name proposed for a ring consisting of one nitrogen atom, one oxygen atom and three carbon atoms.

azoxy The group

, thus *azoxybenzene* is 

azthin An *azine* (which see) in which one carbon atom has been replaced by a sulphur atom, thus the ring consists of one sulphur atom, one nitrogen atom and four carbon atoms.

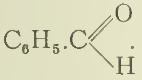
B

β Beta, the second letter of the Greek alphabet (see Appendix H).

basic Compounds that possess the properties of metallic hydroxides or bases, forming salts with acids, etc., are said to be *basic.* On the other hand, an acid is said to be *monobasic* if it possesses one acid hydrogen atom or ion, which is replaceable by a metal, *dibasic* if it possesses two such acid hydrogen ions, *tribasic* if three, etc.

benz A prefix usually indicating derivation from benzoic acid (see *benzal, benzoyl, benzyl*). It is sometimes used to denote derivation from *benzene* (see Bz).

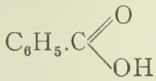
benzal The divalent radical $(C_6H_5CH)''$ derived from *benzaldehyde,*



$$C_6H_5.C\begin{array}{l}\diagup\!\!\diagup O\\ \diagdown H\end{array}.$$

benzenyl The trivalent radical $(C_6H_5.C)'''$ derived from benzoic acid $C_6H_5.COOH$. Thus $C_6H_5.C(OH)_3$ is called *benzenyl alcohol* and $C_6H_5C(N.OH).NH_2$ is called *benzenylamidoxim.*

benzo The trivalent radical $(C_6H_5.C)'''$ derived from benzoic acid,



$$C_6H_5.C\begin{array}{l}\diagup\!\!\diagup O\\ \diagdown OH\end{array}$$

thus $C_6H_5CCl_3$ is called *benzo-trichloridi.* Often the term is used to indicate in a general way derivation from benzoic acid.

benzol In the past *benzol* has been used at times for *benzene.*

benzo-oxy The univalent radical $(C_6H_5COO)'$. It may be considered as benzoic acid which has lost its acidic hydrogen or as formed by replacing the H of a hydroxyl group by a *benzoyl* group, *i.e.,* a benzoyl-oxy group usually contracted to *benzoxy* group (which see).

benzoxy The radical $(C_6H_5COO)'$. Thus the substance beta-eucaine is called *trimethylbenzoxy-piperidin.* The same as *benzo-oxy* (which see).

benzoyl The univalent radical $(C_6H_5CO)'$ derived from benzoic acid, C_6H_5COOH.

benzyl The monovalent group $(C_6H_5CH_2)'$—.

bi A prefix denoting that a compound contains two equivalents of the substances named: as *bichloride, bicyanide,* etc. More generally to indicate salts which have been formed in such a way that but one-half of the acidic hydrogen of the acid is replaced by the base, thus sodium acid tartrate, $NaH(C_4H_4O_6)$ is commonly called sodium *bitartrate*.

bornyl The monovalent radical $(C_{10}H_{17})'$ derived from borneol $C_{10}H_{17}OH$. Thus *bornyl isovalerate* is $CH_3.CH(CH_3)CH_2.$-$COO(C_{10}H_{17})$.

brom The presence of bromine in organic compounds is generally indicated by the prefix *brom,* thus *brom-ethan* is C_2H_5Br and *tribrom-methan* is $CHBr_3$.

bromhydrin A name used to indicate compounds derived from di-atomic or poly-atomic alcohols or in a narrow sense from glycerol in which a part of the hydroxyl has been replaced by bromine, thus 3-brom-propan-1, 2-diol, $CH_2BrCHOH.CH_2OH$, is also called *bromhydrin* (∝-monobromhydrin) (see also *chlorhydrin*).

bromo The same as *brom* (which see), the connective *o* being used for the sake of euphony in *bromoethan,* etc.

Bu In writing chemical formulas it has been proposed to indicate the butyl group $(C_4H_9)'$ by *Bu,* thus BuOH is *butyl alcohol,* $CH_3.CH_2.CH_2.CH_2.OH$.

but A prefix derived from butyric acid, indicating compounds containing four carbon atoms, thus *butane* is C_4H_{10}, *butene* is C_4H_8, *butine* is C_4H_6.

butenyl The monovalent radical $(C_4H_7)'$. Thus $C_6H_5.CH:CH.$-$CH_2.CH_3$ is *l-butenylbenzene.*

butyl The radical $(C_{10}H_9)'$ considered as derived from butyl alcohol $C_4H_9.OH$ by the elimination of hydroxyl or from butane C_4H_{10} by the elimination of hydrogen. Thus $CH_3.CHCl.CCl.$-$CH(OH)_3$ is commonly called *butylchloralhydrate.*

butyryl A prefix denoting derivation from butyric acid C_3H_7COOH. Thus *butyryl chloride* is C_3H_7COCl.

Bz An abbreviation denoting benzene. For its use in nomenclature of *quinoline* derivatives see Appendix I. In the writing of chemical formulas it has been proposed to indicate the benzoyl group, $(C_6H_3.CO)'$ by Bz, thus BzCl is *benzoyl chloride* (C_6H_3COCl).

C

χ Chi, the twenty-second letter of the Greek alphabet (see Appendix II).

cacodyl The monovalent radical $((CH_3)_2As)'$. Thus *cacodyl chloride* is $(CH_3)_2AsCl$.

cacodylate. Derivatives of dimethylarsenic acid or cacodylic acid $(CH_3)_2AsOOH$. Thus *sodium cacodylate* is $(CH_3)_2AsOONa$.

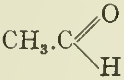
carbamate A derivative, salt or ester, of carbamic acid $CO(NH_2)$-OH; thus $CO(NH_2)(OC_2H_5)$ is *ethyl carbamate* (urethane).

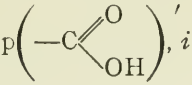
carbamide The amide $CO(NH_2)_2$ of carbonic acid, also called urea.

carbinol A synonym for methanol or methyl alcohol (see also Appendix D–c).

carbocyclic Applied to *cyclic* (which see) compound in which the ring consists of carbon atoms (compare *heterocyclic*).

carbonic acid As a suffix it is used to indicate compounds derived from *carbonic acid,* H_2CO_3, thus *ethyl-carbonic acid,* (C_2H_5)-HCO_3. Incorrectly it has been used as synonymous with the German *karbonsäure* and thus phenyl-chinolin karbonsäure has been translated into phenyl-quinoline carbonic acid instead of phenyl-quinoline-carboxylic acid.

carbonyl The group $(=C=O)''$ found in aldehydes, acids and ketones, thus  $CH_3.C\begin{smallmatrix}\diagup\!\!\diagup O\\ \diagdown H\end{smallmatrix}$, $CH_3.(C=O)\ CH_3$.

carboxyl The group  $\left(-C\begin{smallmatrix}\diagup\!\!\diagup O\\ \diagdown OH\end{smallmatrix}\right)'$, *i.e., carbonyl hydroxyl.* It is usually written COOH or CO_2H. Organic acids owe their acid function to this group (see Appendix G).

carboxylic acid A suffix indicating a carboxyl group, thus quinoline carboxylic acid is a compound in which one hydrogen atom of quinoline has been replaced by the carboxyl group.

carbylamine The monovalent group $(NC)'$, thus C_6H_5NC is *phenyl-carbylamine. Carbylamines* are also called *isocyanides* and *isonitriles.*

chino See *quino.*

chinolin The same as *chinoline* (which see).

chinoline A name applied to *quinoline,* used particularly in German publications.

chlor The presence of chlorine atoms in carbon compounds is commonly indicated by the prefix *chlor,* thus *chlor-ethane* is CH_3Cl and *trichlor-acetic acid* is $CCl_3.COOH$.

chloral Trichlorethanal, $CCl_3.CHO$ is commonly called *chloral.* Incorrectly the term *chloral* has also been used to designate trichlorethandiol or *hydrated chloral,* $CCl_3C(OH)_2$. The term *chloral* has also been at times used in a generic sense to designate related compounds, thus the compound $CH_3.CHCl.CCl_2.CHO$ is commonly called *butyl-chloral.*

chlorhydrate See *hydrochlorate.*

chlorhydrin A name applied to compounds derived from di-atomic or poly-atomic alcohols by partial replacement of the hydroxyl by chlorine, thus 2-chlor-ethan-1-ol, $CH_2Cl.CH_2OH$, is also called *glycol-chlorhydrin.*

chloro The same as *chlor* (which see) the connective *o* being used for the sake of euphony in *chloroethan,* etc.

cinnamoyl The radical $(C_6H_5.H:CH.CO_2)'$ derived from cinnamic acid $C_6H_5.CH:CH.COOH$.

cinnamyl The name commonly given to the radical $(C_6H_5.CH:CH.CH_2)'$ derived from cinnamic alcohol, $C_6H_5.CH:CH.CH_2OH$.

croton A prefix used to indicate derivation or relationship to the *crotonic acids.* The name *croton chloral* was applied to 2, 2, 3-trichlorbutanal or butyl chloral because at the time of discovery this compound was supposed to be *trichlorcrotonic aldehyde.*

crotonic A prefix showing relation to *crotonic acid* C_3H_5COOH. Thus *crotonic aldehyde* is C_3H_5CHO.

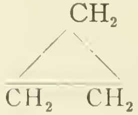
crotonoic The same as *crotonic* (which see).

cyan Containing the group $(CN)'$ a cyanide (see *cyano*).

cyanate The monovalent radical $(.N:C:O)'$, thus *potassium cyanate* is KNCO.

cyanide The monovalent radical $(CN)'$, thus KCN is *potassium cyanide,* and CH_3CN, commonly called ethane-nitrile, is also called *methyl cyanide* (see *cyano*).

cyano Containing the group $(CN)'$, a cyanide.

cyclo A prefix indicating "closed chain" or "ring" compounds; thus *cyclopropane* is  ;*cyclo-hexatriene* is benzene (see Appendix C).

D

d An abbreviation for dextrorotatory (see *dextro*).

δ Delta, the fourth letter of the Greek alphabet (see Appendix H). The letter is also used in the capitalized form ,Δ, to indicate double bonds (see Appendix H).

dec, deca, dekyl Prefixes derived from *deca,* meaning ten, thus *decane* is $C_{10}H_{22}$, *decene* is $C_{10}H_{20}$, *dekylene* is $C_{20}H_{20}$.

deca See *dec.*

dekyl See *dec.*

dextro An abbreviation for *dextrorotatory, i.e.,* rotating polarized light to the right.

di Prefix indicating two, thus *dichlorethane* is $C_2H_4Cl_2$, ethane diol is $C_2H_4(OH)_2$.

diatomic Alcohols and phenols containing two hydroxyl groups; diols are said to be *diatomic.*

diazine An *azine* containing two nitrogen atoms (see *azine*), *i.e*, a ring consisting of four carbon atoms and two nitrogen atoms united by nine "bonds." The three isomeric diazines are distinguished by numbering the nitrogen atoms, thus: *1, 2-diazine, 1, 3-diazine* and *1, 4-diazine,* or in the same order as *ortho-diazine, meta-diazine* and *para-diazine* and also as *oiazine, miazine,* and *piazine.*

diazo A prefix indicating the group N : N (di + azo), thus C_6H_5.-N : N.Cl is *diazobenzene chlorid.*

din Ending used by Eclectics to indicate oleo-resins, thus *Iridin, Pteledin, Asclepedin.* Ending not in general use.

dodec The same as *dodeca* (which see).

dodeca A prefix indicating twelve, thus $C_{12}H_{20}$ is *dodecane* (dodec and ane).

E

ε Epsilon, the fifth letter of the Greek alphabet (see Appendix H).

η Eta, the seventh letter of the Greek alphabet (see Appendix H).

en See *ene.*

ene The suffix *en* or *ene* generally indicates the unsaturated group C:C, thus $CH_2 : CH_2$ is ethene (eth-ene). Exceptions: *terpene, naphthalene, anthracene,* etc.

enol The suffix *enol* (en + ol) indicates an unsaturated alcohol, thus CH_2 : CHOH is *ethenol.*

epi See Appendix J–e.

erythr Derived from the Greek, ἐρυθρός, meaning *red* and having reference to this color in such compounds as *erythro-dextrin,* a form of dextrin which becomes red on treatment with iodin. It is generally used to designate relation to butane tetrol $CH_2OH.CHOH.CHOH.CH_2OH$, commonly called *erythrol,* or *erythrite,* because of its original preparation from *erythrin,* a naturally occurring compound yielding a red color.

erythro The same as *erythr* (which see).

ester Esters are compounds in which the hydrogen ions of acids, organic or inorganic, have been replaced by organic radicals, thus acetic acid, CH_3COOH, and ethyl alcohol, C_2H_5OH, form $CH_3COO(C_2H_5)$, *acetic-acid-ethyl-ester* or *ethyl acetate*.

Et Used in chemical formulas to represent the ethyl group $(C_2H_5)'$; thus ethyl alcohol, C_2H_5OH, is sometimes written EtOH.

eth A prefix indicating compounds with two carbon atoms, thus C_2H_6 is *ethane*, C_2H_5OH is *ethyl alcohol* or ethanol, etc. Also used to indicate the ethyl group in writing formulas, thus $CH_3.CH_2.CH(C_2H_5).CH_3$ is also written $CH_3.CH_2.CHEth.CH_3$.

ethenyl The monovalent radical $CH_2:CH—$ derived from ethene.

ether Ethers are oxides or monovalent hydrocarbon radicals, thus *ethyl ether* (Ether, U.S.P.) is $C_2H_5O.C_2H_5$. See *oxy*.

ethidine See *ethylidene*.

ethinyl The monovalent radical $(CH:C—)'$ derived from *ethine*.

etho The monovalent group $(CH_3.CH_2—)'$ when it is contained in a side-chain (see Appendix A).

ethoxy The group $(CH_3.CH_2O)$ derived from ethyl alcohol, $CH_3.CH_2OH$.

ethyl The monovalent radical $CH_3.CH_2—$, derived from *ethane*.

ethylal The monovalent radical $(—CH_2.CHO)'$ derived from *ethanal*, $CH_3.CHO$, and still retaining its aldehyde group.

ethylene A synonym for *ethene*. Also applied to bodies containing the group $(—CH_2.CH_2—)''$ being derived from ethene, thus 1, 2-dichlorethane, $CH_2Cl.CH_2Cl$ is also called *ethylene chloride*.

ethylenyl The trivalent radical $(C_2H_3)'''$. See also *ethylidene*.

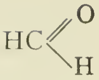
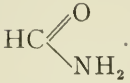
ethylidene The divalent radical $(CH_3.CH)''$, thus 1, 1-dichlorethane is also called *ethylidene chloride* or *ethidine chloride*. The term has also been used to indicate the radical $CH_3.C'''$; thus chloral, CCl_3CHO, has been called *trichlor-ethidine aldehyde* and *trichlor-ethylidene*.

ethylol The monovalent radical $(—CH_2.CH_2OH)'$ derived from *ethanol* and still containing the alcohol group.

F

figures For numerals 1, 2, 3, etc., see Appendix B.

five See Appendix B.

form A prefix denoting derivation from or relation to *formic acid* (methanoic acid) HCOOH, thus *formaldehyde* is  $HC\langle\begin{matrix}O\\H\end{matrix}$ *formamide* is  $HC\langle\begin{matrix}O\\NH_2\end{matrix}$. In *chloroform* (also *bromoform* and *iodoform*) the suffix form indicates the radical CH''' derived from formic acid.

formo The same as *form* (which see).

formyl The group (HCO)'' derived from formic acid HCOOH. The term formyl has also been applied to (HC)''', assumed to be contained in chloroform, $CHCl_3$ (see *form*).

furfural The divalent radical $(C_5H_4O)''$ derived from furfurol (*furfuraldehyde*) $C_4H_3O.CHO$.

furyl The monovalent radical $(C_4H_3O)'$ derived from furan (furfuran) C_4H_4O. The term furyl is sometimes also applied to furomethyl $C_4H_3O.CH_2'$, thus *furyl acetate* is $C_2H_3O_2.C_5H_5O$.

G

γ Gamma, the third letter of the Greek alphabet (see Appendix H).

glyceryl The triatomic group $(C_3H_5)'''$ derived from glycerol, $C_3H_5(OH)_3$, thus the nitric acid ester of glycerol, $C_3H_5(NO_3)_3$, is often called *glyceryl nitrate.*

glycol (a) A name applied to ethan-1, 2-diol, $CH_2(OH).CH_2(OH)$. (b) The term *glycol* is also used to indicate derivatives of ethan-1, 2-diol, thus ethanolal, $CH_2OH.CHO$, is commonly called *glycolic aldehyde* and ethanolic acid, $CH_2OH.COOH$, is called *glycolic acid.* (c) The term glycol is used in a generic sense to indicate diatomic alcohols, thus trichlorethandiol (hydrated chloral, U.S.P.) has been called *trichlorethidene-glycol.*

glycyl The term has been used to indicate derivatives of glycocol, $CH_2NH_2.COOH$, from which hydroxyl, OH, has been replaced; thus *glycyl-tryptophan* is a compound of tryptophan and glycol having the formula: $(C_{11}H_{11}N_2)CO.CH_2.NH_2$.

Greek alphabet See Appendix H.

H

hemi Derived from the Greek *hemi,* meaning half, the prefix is used to show the relation of simpler bodies to related more complex forms, thus $C_6(COOH)_6$ is called mellitic acid and

$C_6H_3(COOH)_3$ is called *hemimellitic acid.* Hemicellulose is a body similar to but more simple than cellulose.

hept Hept, Hepta, Heptyl, prefixes derived from *hepta,* meaning seven, thus *heptane* is C_7H_{16}, *heptene* is C_7H_{14}, *heptyl-alcohol* (normal) is $CH_3(CH_2)_5.CH_2.OH$.

hepta See *hept.*

heptyl See *hept.*

heterocyclic A cyclic carbon compound containing besides carbon, one or more other elements in the ring.

hex Hex, hexyl, prefixes derived from *hex,* meaning six, thus *hexane* is C_6H_{14}, *hexene* is C_6H_{12}, *hexyl-alcohol* (normal) is $CH_3(CH_2)_4.CH_2.OH$.

hexyl See *hex.*

hom The same as *homo* (which see).

homo The prefixes *hom* and *homo* meaning "the same" are used to show relation of one compound to another. Thus conic acid and *homoconic acid* and atropine and *homatropine.*

hydrate Used to indicate water of hydration (less correctly called water of crystallization); thus, *oxalic acid dihydrate* for $H_2C_2O_4 + 2H_2O$. In the past the term has also been used to indicate hydroxides, thus 2-methyl butan-2-ol, $CH_3.CH_2.C(CH_3)(OH)CH_3$, is commonly called *amylene hydrate* (derived from amylene by hydration), thus $CH_3.CH:C(CH_3).CH_3 + H_2O = CH_3.CH_2.C(CH_3)(OH).CH_3$.

hydrazide A hydrazide is a compound derived from hydrazine, $H_2N.NH_2$ by replacement of hydrogen with acyl groups; thus primary *acetyl-hydrazide* is $CH_3CO.HN.NH_2$ and symmetrical, secondary, *acetyl-hydrazide* is $CH_3CO.HN.NHCH_3CO$.

hydrazine Bodies derived from diamide, $NH_2.NH_2$, thus $C_6H_5.NH.NH_2$ is *phenyl hydrazine.*

hydrazo Indicates the group $(—NH.NH—)'$. Thus $C_6H_5.NH.NH.C_6H_5$ is *hydrazo-benzene.*

hydrazone A hydrazone is a compound formed by the condensation of a hydrazine with an aldehyde or a ketone, thus phenylhydrazine and acetaldehyde condense to form *acetaldehyd-phenylhydrazone,* thus $C_6H_5NH.NH_2 + CH_3CHO = C_6H_5NH.N(CH_3CH:) + H_2O$ and phenylhydrazine and acetone yield *acetone-phenylhydrazone,* thus $C_8H_5NH.NH_2 + (CH_3)_2CO = C_6H_5NH.N:C(CH_3)_2 + H_2O$.

hydride A hydrogen derivative. Thus ethane may be considered as derived from ethyl alcohol, C_2H_5OH, by replacing the hydroxyl group by hydrogen, $C_2H_5.H$ and hence is sometimes called *ethyl hydride*. Similarly cyclohexane may be considered as derived from benzene by addition of six hydrogen atoms and then is represented by the formula $C_6H_6.H_6$ and called benzene *hexahydride*.

hydrin See *chlorhydrin* and *bromhydrin*.

hydro The prefix denotes the presence of hydrogen. Thus the compound $C_6H_5.CH_2.CH_2.COOH$ is called *hydrocinnamic acid* because it is produced from cinnamic acid $C_6H_5.CH:CH.COOH$ by reduction; *i.e.,* absorption of hydrogen. It is often used in the naming of hydrides, that is, for compounds in which hydrogen is combined directly, without intervention of oxygen with carbon, thus compounds of hydrogen and carbon are called *hydrocarbons* and the hydrides of benzene (reduced benzenes) are called *dihydrobenzene*, *tetrahydrobenzene* and *hexahydrobenzene*.

hydrobromate See *hydrobromide*.

hydrobromide The bromides of organic bases, such as aniline, the alkaloids, etc., are commonly called hydrobromides or hydrobromates, in the same way and for the same reason that ammonium bromide was formerly called *ammonia hydrobromide*.

hydrochlorate The same as *hydrochloride* (which see).

hydrochloride The chlorides of organic bases are commonly called hydrochlorides or hydrochlorates. Compare *hydrobromide*.

hydroxy A prefix indicating hydroxyl, thus *hydroxybenzene* is phenol, C_6H_5OH, *ortho-dihydroxybenzene* is 1, 2-phendiol or pyrocatechol, $C_6H_4(OH)_2$.

hydroxyl The monovalent group $(OH)'$, considered as derived from water (hydrogen oxide).

(To be continued.)

A NOTE ON THE PROPOSED FORMULA FOR PETROX.

By John K. Thum, Ph.G.
Pharmacist at the German Hospital, Philadelphia, Pa.

To the writer's mind the adoption of the proposed formula in place of the present one in the National Formulary for Petrolatum Saponatum Liquidum, or "Liquid Petrox" as it is more commonly called, would be an unwise step. The present one is very readily made, never necessitating the use or application of heat, saponification begins at once and in less than a moment's time is complete.

In the proposed formula stronger ammonia water is used instead of the alcoholic spirit of ammonia. This change is, in my opinion, a mistake. Those who advocate this change use this argument: " Spirit of ammonia is so rarely called for, that it is kept in stock by comparatively few druggists and even when in stock it is usually deteriorated and of uncertain strength." This seems to me a very poor argument, in fact, no argument at all; the same thing could as well be said of stronger ammonia water. Real pharmacists always see to it that the ingredients that enter into the manufacture of their preparations are of the required standard; those who do not must necessarily allow themselves to be taken care of by the manufacturing pharmacists.

The directions for mixing the ingredients in the proposed formula are faulty. In the writer's experience he has been unable to induce saponification by following the directions in the proposed formula. These directions are as follows: " Mix the liquid petrolatum, oleic acid and oil of lavender flowers in a flask, then add the alcohol and finally the stronger ammonia water and agitate thoroughly until clear, warming the mixture slightly, on a water-bath if necessary." The writer followed these directions very closely several times and each time without favorable result. However, by adding the stronger ammonia water to the alcohol and then this mixture to the liquid petrolatum and oleic acid previously mixed together saponification was obtained but the application of heat was essential.

The addition of the oil of lavender flowers before saponification takes place is also subject to criticism. Saponification always generates more or less heat; and for obvious reasons heat should not be brought in contact with desirable odoriferous principles.

" Hold on to those things that are good " should be the aim of the revision committee, and in this case the present National Formulary formula is good. The addition of a small amount of essential oil to it to disguise any disagreeable odor the preparation might have cannot be objected to.

In order to place the matter before the committee of revision of N.F. in a concrete form, the writer advises the retention of the present formula with the addition of an essential oil as follows:

Liquid petrolatum	100 c.c.
Oleic acid	50 c.c.
Spirits ammonia, U.S.P.	25 c.c.
Oil of lavender flowers	3 c.c.

Mix the liquid petrolatum, oleic acid and spirits ammonia; when cool, add the oil of lavender flowers and keep in a dark place.

SUNDAY REST AND SHORTER HOURS OF LABOR FOR PHARMACISTS.

By Edgar Reed Sparks, Ph.G.

Numerous are the splendid articles which have been written and published on this subject, and equally numerous are the excellent addresses which have been delivered in the effort to persuade pharmacists to decrease the number of their hours of labor, especially their hours on Sunday; in fact, the subject has been so thoroughly covered that it seems unnecessary for an obscure druggist to attempt to offer a contribution to the cause.

The writer fully recognizes the difficulty of finding something new to help the cause, and believes that he can probably render no better assistance than to collect and present portions of some of the many helpful contributions which have previously been published, hoping that the repeated message may reach some of those who have not read nor heard the original articles.

The fact that pharmacists realize the importance of this subject seems to have been clearly indicated by the manner in which the matter was received at three important pharmaceutical meetings last year; the first of these was the annual meeting of the "Penna Pharm. Ass'n," in June, at which Mr. Joseph W. England, of Philadelphia, presented the splendid resolutions urging the pharmacists of the State to adopt a Sunday closing plan; these resolutions were heartily adopted and have since appeared many times in print, doubtless being of great benefit to the cause.

The second event was at the annual meeting of the "American Pharmaceutical Association" in Boston last August, when Dr. Clement B. Lowe, of this city, presented his paper entitled *"Some Every-day Problems."* We were informed that the largest space in this paper was devoted to the Sunday closing proposition and that after the reading of the paper an interesting discussion took place; Mr. B. E. Pritchard, of Pittsburg, states that "many of the leaders in thought and right action spoke on the subject, *not one in opposition."*

The third event was at the annual convention of the "National Association of Retail Druggists" at Niagara Falls in September last, when the "Committee on Fraternal Relations" presented their report which dwelt almost entirely upon the "Sunday Rest and

Shorter Hours of Labor" problem; the report was favorably received and the writer was informed that many delegates expressed their hearty approval of the same.

It seems quite appropriate that reference should again be made to that excellent contribution to the cause made by Mr. Robert A. Leet, of California, in his paper entitled "Sunday Closing," presented at the Richmond meeting of the "A.Ph.A." in 1910; this paper has been widely published and deserves careful consideration by every pharmacist interested in the Sunday Rest proposition.

Mr. Leet's paper begins with the assertion that "there are but two possible reasons for keeping a drug store open on Sundays: either the money that can be made by keeping open, or else the desire to serve the community represented." The following facts taken from the paper are worthy of special attention: In the year 1907, when the firm of which Mr. Leet is a member decided to close their stores on Sunday, except from 9.00 A.M. to 2.00 P.M., their business on Sundays was a very substantial portion of their whole business, large enough so that if they lost it without any corresponding gain through the week they would be very seriously crippled; quoting the author's own statement:

> After nearly three years now we believe we are prepared to speak on the question of pecuniary loss, and feel that if there is any at all it is so very slight that the advantages and benefits accruing far more than offset it. Our receipts, of course, were very much reduced on Sundays, but we think that they were sufficiently augmented during the week to offset the reduction. We feel certain that as a result of our better hours we have had a choice in the selection of clerks such as we would never have otherwise had. We know that good men have been influenced to place their applications with us by reason of our Sunday closing, and we feel that the moral of our working force is on a higher plane. We feel that on these accounts alone we are more than repaid for the stand that we have taken: and be it understood, we are absolutely independent in this movement, having closed our stores regardless of the fact that our competitors all around us keep open. So much in answer to the question of pecuniary loss.
>
> I think that the druggist who can satisfy himself that he is justified in adopting Sunday closing from the dollar-and-cent point of view can readily find a way to see that his clientage suffers no great inconvenience by reason of his action.
>
> Now there are some few important details to be considered once Sunday closing is decided upon. In the first place, it is very important that you should not take any action which would appear arbitrary to your customers. You will find them practically unanimously in favor of any movement for the betterment of hours if it is presented to them properly, and

> yet the same people will freely criticise you as being independent and indifferent to their urgent needs if you do not take them into consultation regarding any shortening of hours to your service to them. In our own case we first of all sent out a personal communication to each physician, telling him it was our intention to close if our plan was agreeable alike to the physician and the community at large, but emphasized the fact that regardless of our desire to better our conditions and that of those in our employ, we realized that our first duty was to minister to the needs of our patrons, and that in the case of a very small percentage of unfavorable replies we should consider our plans.
>
> We then sent a similar notice to each customer whose name appeared upon our books and simultaneously placed large advertisements in the local papers, setting forth our reason for making the movement, and asking for an expression of approval or disapproval. The returns far exceeded our expectation. The personal communications were responded to almost without exception, and we received literally thousands of signed coupons cut from the papers. In addition to this, we received coupons bearing long lists of signatures of the employees of some of the larger establishments, and not a few expressions of approval from labor organizations. There were but two unfavorable answers among the thousands of replies received.
>
> With the substantial endorsement we entered upon our plan with enthusiasm, and at this time, after nearly three years of trial, we repeat what we have often said before, that there has been no single action in connection with the conduct of our business that has afforded so much satisfaction as this one of Sunday closing. I urge upon the druggists of the country its favorable consideration. If we are to make our calling attractive to the better class of men we must make it a business rather than a grind.

A letter sent to Mr. Leet by the writer, a few months after the publication of his paper, thanking him for the service he had rendered the cause, brought this reply:

> The paper was written hastily and is not as strong as it might have been made.

About a year later, in August of last year, Mr. Leet stated regarding the Sunday closing situation:

> In our own case we have for the past several months kept our doors closed entirely except to emergencies on Sunday. All of the stores in San Francisco and Oakland are now closing between the hours of one and six P.M. I believe if the Sunday closing is practiced with due reference to the requirements of the community that it will grow in favor and that it will become a permanent condition, and I believe that it will have a great deal to do in the long run in getting better men into the business, and making better men out of the men who are already in it;

and in a letter written a few weeks ago regarding the Sunday closing situation in these cities, he states:

> We think that there is no desire to go back to the "all day" open stores.

Coming nearer home for some examples of the successful operation of the Sunday closing plan, we refer to the store of Mr. Charles Holzhauer, located on a busy corner in the City of Newark, New Jersey. Mr. Holzhauer has had fifty years' experience in that city and his store has never been open on Sunday except during certain hours; at present this store is open on Sunday between the hours of 10.00 A.M. and 12.30 P.M. and from 7.00 to 9.00 o'clock P.M.; the business during this period being limited strictly to drug work, with one man in charge; at the last annual meeting of the "N.J.P.A.," in speaking of his experience in "Sunday closing," Mr. Holzhauer said:

> I don't believe I have lost one cent by doing this; I have as strong a competition as any man in New Jersey, and it is getting stronger every day, and *if I should live to be fifty years longer in the business I am determined never to be open on Sunday*. I remember well a very prominent member of this organization, and one whom I thought a great deal of, talked to me many times about this. He wished he could do as I did on that question. I asked him, "Why don't you?" He said he could not close on Sunday, as that was his best day, and he could not afford to give up the returns of the business on Sunday. I answered him that "My firm belief is, you will prosper more by closing your store on Sunday than by keeping open." When that man died there was not money enough to pay his debts. So far as the necessity of the store being open on Sunday, there is no more reason why a drug store should be open all day than it should be open all night.

Coming directly home for another example of Sunday closing, we are pleased to refer to the store of Mr. Henry C. Blair, at 8th and Walnut Streets, this city; this store is open on Sunday from 9.00 A.M. to 12.30 M. and from 6.00 to 9.00 P.M., except the period from July 1st to September 15th, when the service is further shortened and the Sunday hours are then from 9.00 to 11.00 A.M. and from 7.00 to 8.00 P.M.

In an interesting letter Mr. Blair writes as follows:

> On Sundays I positively do not sell soda water, cigars, candy nor postage stamps. My instructions to clerks are "sell only medicines and necessities." This custom in my store has been carried out since my grandfather purchased the store. My prescription work is just the same as it always has been. I do much more business on Mondays and Saturdays than any other days of the week, showing that my customers realize that they must purchase on other than Sunday. I believe I could do more business by keeping open on Sunday, but eventually I would lose, because a man

who does not have at least one day a week for rest and recreation is not fit to do his best in work.

The writer believes that this Sunday closing practice has played no small part in contributing to the success and enviable reputation which the Blair store has always enjoyed.

In the resolutions adopted by the "Pennsylvania Pharmaceutical Association" last year occurs this clause:

> We believe that the public, if properly advised of the facts, will be entirely willing to adjust its habits to shorter hours of work for the druggist, just as it has adjusted itself to shorter hours in other lines of work.

The experience of Mr. Leet's firm, previously related, proves conclusively the correctness of this assertion.

BROTHER PHARMACISTS: Sunday closing can be successfully adopted and the public are ready for it; shall we not proceed at once to put it in effect?

SHORTER HOURS FOR PHARMACISTS.

By CLEMENT B. LOWE, M.D.

Some one has said that God never did a kinder thing for the human race, after turning them out of the Garden of Eden, than to ordain that man should earn his bread by the sweat of his brow, "for idleness is the root of all evil," according to another authority. We all know what follies the idle rich are often guilty of.

We all are probably willing to concede that work is a blessing that makes the hours of the day fly apace, and yet one can have too much of even a good thing, "all work and no play, makes Jack a dull boy." The result of long hours of continuous labor, day after day, especially if carried on indoors, may be damaging to health, possibly lowering the vitality so as to make one susceptible to disease.

One of the trustees of the College said he received some excellent advice when he first insured his life, from the medical examiner: he was told that the drug business was not conducive to health and was advised to take as much out-door exercise as possible; he attributes his present excellent health to his opportunities for following the advice. If continuous labor does not affect our health, it may affect our spirits, sapping our enthusiasm and producing a kind of mental lethargy. One apothecary in speaking of his too long hours of continuous labor, said that when through with the labor of the long day, he was too tired to plan for the improvement of his business, or to study up new things. It might have been quoted to him Arnauld's saying: "Rest! Rest! Shall you not have all eternity to rest in."

The social economist tells us, that the ideal division of the day is into three parts: eight hours for work, eight hours for rest, eight hours for recreation, and many mechanics and office men, especially those working for municipalities, have attained to this ideal division. It is difficult at times to draw the line between work, rest and recreation, change of labor is recreation to some, men whose work is of a sedentary character that confines them closely to their desks, frequently enjoy working in a garden, or cultivating flowers. Locke says "pleasant tasks depend not on the things themselves, but on their agreeableness to this or that palate." The writer has frequently seen the hard-worked pharmacist derive both pleasure and profit from an amateur game of base-ball.

Another side of the question which we do not often hear brought out is, that the long hours of the drug business deter many young men from entering the business who would have been an ornament to it. It is safe to say that many of the young men who in the past have taken up pharmacy, have not done so deliberately, but have rather drifted into the business; this drifting under the new educational requirements will greatly lessen, a young man will hesitate about taking up a business that demands nearly all of his waking hours, he will say to himself, *cui bono* (what good), he will be tempted to take up some other occupation that will pay him equally well for shorter hours of service; this will lessen either the quantity or quality of clerks.

The question will arise, can the pharmacist supply the wants of his customers equally well in shorter time? I emphatically say yes. The retail grocers have tried this out successfully; a few years ago every grocery kept open until 9 or 10 P.M., now on five days of the week they close promptly at 6 P.M. Have you heard of anyone starving to death, or even going hungry by this action?

The writer well remembers a grocery in the country town in which he resided when a boy. It was kept open every week day evening until 10 P.M. After the supper hour a number of the old cronies residing in the neighborhood used to assemble in the grocery. Seated in the split-bottom chairs surrounding the clay cylinder stove, they would smoke their pipes, or chew their tobacco, from time to time squirting a stream of liquid juice with considerable dexterity into the sand-box in which the stove was placed. The politics of the day were discussed, the battles of the Civil War were fought over again. They marched up and down the peninsula with McClellan, they besieged Vicksburg with Grant, and were victorious with Meade at Gettysburg. The Emancipation Proclamation and other great questions of the day were discussed with much heated argument, feeling sometimes being as hot as the stove. Once in awhile a customer or two would stray in, but excepting Saturday night the business done was small, the most of the time the grocer was lolling over the counter, taking more or less interest in the debate, in which he occasionally joined. About 9 P.M., or shortly after this, the debating club would break up. One of its members would say, " I want a pound of coffee," another, " my wife told me to bring her home some tea," and others would have various wants, so that until the closing hour of 10 P.M. there was quite a bustle in the store. The grocer had supplied room, fuel and light for these free American citizens, and had been kept from his own family, because he was not at that time the manager of his own business, he has grown wiser since.

Perhaps you will say that a grocery is not in the same class with a pharmacy; the first is a convenience, the second a necessity, but there is no more reason why the drug store should be kept open to supply remedies for every ache and ailment that flesh is heir to, than for a grocery to keep open to supply food every time a man is hungry. People in the country, miles away from a drug store, are usually wise enough to keep a number of remedies in the house, and every physician carries a few remedies for emergencies. Another reason why prescription business sometimes runs late in the day, is, that calling the physician is often put off until late in the day, or evening, with the view of saving the physician's fee. One physician endeavors to prevent this by charging a double fee for all calls sent in after 6 P.M. If he is called previous to that time and cannot get there until after 6 P.M. no extra charge is made. I have said previously, that the question may be asked, Can the pharmacist supply his customers' wants in a shorter time than at present? I think that he can; it is rarely that the whole force of the store is continuously employed. It would be better to concentrate the business into shorter hours than to have it drag out its slow length. To concentrate business might require more systematic methods of doing business, as far as the counter or prescription business would allow; in many stores the business is just allowed to drift.

What are the hindrances to shorter hours? Apathy is one. "There's no use in trying," says one, "nothing can be done." Another says, "I will close earlier if my neighbor will," and he will, if his neighbor will, and so we go until we bump up against a store that keeps open all night, "and the fat is in the fire."

When an agreement has been made, it is not always kept. I have known of a druggist walking out into the street to see if his neighbor's window-lights were still burning. Wm. E. Krewson, for many years the secretary of the Alumni Association of the P.C.P., used to say that where an agreement for closing had been made, all trouble might be avoided, if when required to keep open beyond the specified time, the window-lights should be put out. Every pharmaceutical student who is trying to work his way through college knows how difficult it is to keep up with his classes, if he works from 7 A.M. to 11 P.M., as some do; all time for study has to be taken from his greatly needed rest.

I have no doubt that every clerk present will agree with me that shorter hours are not only desirable, but are in fact a necessity, and that any proprietor who will not do his best to assist in this much needed reform is a mean "old codger," as I have heard him called. But will they keep this same opinion when they get into business for themselves and are so anxious for success; in fact, need every dollar that can possibly be taken in? Will they not be tempted to extend the time so as to secure a little additional revenue? I think this is one of the evils resulting from the starting of a new store where one is scarcely needed, especially is this the case where the new store has been started by the clerk of a former employer. Sometimes a store is bought out by a new man who will not be bound by the rules previously tacitly agreed upon, and keeps open to a later hour, and thereby forces the others to do the same. The writer knows of a case of exactly this kind, in a suburb of the city where the closing time agreed upon had been 9 P.M., an hour at which most of the good people of that section in the winter were in bed, the newcomer, an ambitious young man, would not be bound by the previous agreement but kept open until 10 P.M., and the others of course followed suit.

I think the cause of "shorter hours" is making headway. Much attention is being given to this subject in different parts of the country, and agreements are being made whereby this reform is being carried into effect. One of the trustees of the College in whose store quite a business is done on Sunday, told me a few days ago that he was making arrangements by which those who are on duty on Sunday will have an extra afternoon on Monday. Shorter hours should be comparatively easy of achievement in many country towns. I would not wait until every pharmacist had agreed to the measure, for some people are so naturally obstinate that it seems impossible for them to agree to anything that anyone else advocates. If they propose anything themselves it is all right. In a country town in winter the closing time should not be later than 8 P.M. The most of the druggists could get together and announce the new departure in the papers and on prominent hand-bills, giving their reasons for their action, namely, the duty which they owe to their families, to their health, to their social natures, to their intellectual natures, to their spiritual natures, and that by this new departure they expected to be in a better mental and physical condition for their work and consequently would be able to give their customers better service. Such a course of action would probably enlist the sympathy and co-operation of most of the citizens; the druggist who refused to join in the new departure would find himself out of touch with most of the people, perhaps despised by many. I have said nothing about shorter hours on the Sabbath in this paper, not because I do not believe in them, but because I did not wish to trespass upon the subject assigned to my colleague of the afternoon, but perhaps a few words may not be amiss. I am satisfied that the chief obstacle to shorter hours on the Sabbath is the "spirit of gain"; in fact, I have been told by several, that if it were not for the Sabbath business it would not pay to run their stores. The modern and beautiful soda-water fountains have so much money locked up in them that no opportunity must be neglected to make them profitable, and the patronage of this day is considered by some as being worth as much as any other three days of the week. If the practice of Jacob H. Redsecker, of Lebanon, of most honored memory, were followed, the business on this day of the week would be confined to actual necessities. It was the custom of Mr. Redsecker and his partner, Mr. George Ross, to devote all of the profits of this day's business to missions.

In conclusion I hope that I have said something this afternoon that will set you thinking. I thank you for your kind attention.

PROGRESS IN PHARMACY.

A Quarterly Review of some of the more interesting Literature relating to Pharmacy and Materia Medica.

By M. I. Wilbert, Washington, D. C.

Pharmaceutical history is accumulating apace just at the present time, so much so that it is really difficult to keep in touch with or even to recognize all of the various activities that are destined to affect the practice of pharmacy quite profoundly in the very near future.

This fact is readily shown by recent developments in connection with the work of the Division of Pharmaceutical Chemistry of the American Chemical Society. The winter meeting of this division was devoted largely to the discussion of pharmacopœial problems and a number of resolutions bearing on the nature and content of the Pharmacopœia were adopted and referred to the Committee of Revision. (*J. Ind. & Eng. Chem.* 1912, v. 4, pp. 150–151.)

These resolutions relate to the form of stating solubility data, the retention of the form and style of spelling the names now in the U.S.P., the method of stating the purity rubric and the inclusion of accurate tables giving the refractive indices of mixtures of alcohol and water.

The Journal of the American Pharmaceutical Association.—Number 1 of Volume 1 of the *Journal of the American Pharmaceutical Association* is dated January, 1912, and while it marks the passing of the well established and generally appreciated "Proceedings" and the more recent "Bulletin," it also marks the opening of a new Era of usefulness and development on the part of the American Pharmaceutical Association. Taking the first number as a fair suggestion of the scope and nature of the Journal, American pharmacy is to be congratulated on the acquirement of an additional periodical of high standing and exceptional ideals. While the prime object of the Journal is to furnish a more direct and speedy means of communication between the Association and its members, pharmacy at large cannot help but be benefited by the work that is reflected in the pages of this Journal.

The comments appearing in current medical and pharmaceutical journals have been uniformly commendatory though there appears to be a general feeling of regret that the well edited, useful and in many ways unique volume of "Proceedings" will no longer be issued.

The *Pharmaceutical Journal* (London 1912, v. 88, p. 87), in commenting on the *Journal of the American Pharmaceutical Association,* expresses the opinion that the passing of the familiar Annual Proceedings will be a cause of keen regret.

TRANSACTIONS OF THE SECTION ON PHARMACOLOGY AND THERAPEUTICS of the American Medical Association at the Sixty-second annual session held at Los Angeles, Cal., June 27 to 30, 1911, have been reprinted in the form of a large 8vo volume of 350 pages. Many of the papers included in this volume are of direct interest to pharmacists and the volume as a whole represents a reflection of the activities of medical practitioners to arouse greater interest in scientific materia medica and the elimination of fakes, frauds and inert materials from the drug armamentarium of present day medical practitioners. Pharmacists who are really interested in the progress of the sciences related to pharmacy should not fail to include this reprint among their books of reference. The book is published by the American Medical Association and is sold at the moderate price of one dollar, postpaid.

THE FOURTH REPORT OF THE WELLCOME TROPICAL RESEARCH LABORATORIES at the Gordon Memorial College Khartoum, Published for the Department of Education, Sudan Government Khartoum, is now being distributed. The present report compares favorably in appearance and variety of content with previous reports from the same Laboratories and it is indeed difficult to determine which of the several excellent features are most to be commended. The report appears in two volumes: volume A.—Medical, and volume B.—General Science. The latter volume contains several communications that are of direct interest to pharmacists. These papers include a test for hashish and the reports of experiments on gum production in Kordofan. The two volumes are exceptionally well illustrated and this with the interesting nature of the contained material should make them a welcome addition to any medico pharmaceutical library.

AUSTRALASIAN PHARMACEUTICAL FORMULARY, 1911.—The Australasian Pharmaceutical Formulary has now been published. It is a small pocket book of a hundred pages, and is sold at one shilling. The first edition was published in 1902, and since that time the conditions of pharmacy in Australasia have altered considerably.

The main idea of the work is that physicians may have at their disposal a series of preparations correct in their constitution, both physically and chemically; the subsidiary object is to place in the hands of the pharmacist a set of workable formulae, with full directions as to their manipulation, and only such preparations as can be made in any reasonably well equipped pharmacy are included. Each process has been thoroughly tested, we are assured, and, while a number of the formulae are the result of original experiments, others have been drawn, with or without modification, from various sources, but chiefly from the B. P. Codex. There is a full list of trade names and synonyms provided; in fact, this constitutes a greater portion of the booklet, occupying as it does sixty-four of the hundred pages. The nomenclature adopted is that of the British Pharmacopœia.—*Pharm. J.* (Lond.), 1911, v. 87, p. 776.

WILEY INVESTIGATION.—An editorial (*J. Am. M. Ass.,* 1912, v. 58, p. 347) calls attention to the report of the Committee on Expenditures of the Department of Agriculture, popularly known as the Moss Committee. This Committee after making an extensive investigation " from the evidence adduced that the accused officials were actuated throughout by a desire to procure from the Bureau of Chemistry an efficient assistant in the person of Dr. H. H. Rusby under terms and conditions which those officials believed to be in entire accord with the law, regulations and practice of the Department of Agriculture."

BUREAU OF CHEMISTRY RULING.—An editorial (*Western Druggist,* 1911, v. 33, p. 622) points out that the Board of Food and Drug Inspection of the Department of Agriculture has decided that, hereafter, before publication of its decisions, those concerned will be given an opportunity to be heard in defense of their product.

SODIUM BENZOATE.—A number of articles discussing the " Expert Opinion of the Royal Scientific Deputation for Medical Affairs Regarding the Use of Benzoic Acid and Its Salts for the Preservation of Food " have appeared during the past months in pharmaceutical, medical and scientific journals. It appears that the original translation of the report, as given out to pharmaceutical and medical journals was either poorly done or purposely garbled. A correction, in the original German, by the members of the Royal Scientific Deputation, appears in the *Journal of the American Medical Association* (Jan. 20, 1912, v. 58, p. 199) and should serve to end the unnecessary and useless controversy.

INTERNATIONAL OPIUM CONFERENCE.—The International Opium

Conference was opened at the Hague on December 1 by Dr. Van Swinderen, Dutch Minister of Foreign Affairs. Twelve nations were represented at the Conference, comprising Great Britain, Germany, France, Holland, Italy, Russia, Protugal, China, Japan, Persia, Siam and the United States, all the powers being represented on the Shanghai Commission of February, 1909. Turkey was especially invited to take part, but declined. The Right Rev. C. H. Brent, Bishop of the Philippines, who presided over the Shanghai Congress, was elected President, and in accepting the honor, referred to the great problem involved in the opium question. He believes the Shanghai Conference pointed the way for the legislation to be adopted, and he hopes that the legislative Acts which should result from the work of the Conference would have the opinion of the whole world behind it.—*Chem. & Drug.*, 1911, v. 79, p. 860.

The International Conference at The Hague regarding the preparation and sale of opium, morphine, cocaine and related narcotics has finally adjourned and the protocol signed by the representatives of the several governments represented is destined to have a far reaching influence on the practice of pharmacy throughout the world. The limitations that will necessarily be imposed on the manufacture and sale of products ordinarily classed as narcotic drugs will be far reaching and to be at all effective must be radical.

An editorial (*Chemist and Druggist*, 1912, v. 80, p. 190) points out that the contracting powers have agreed among themselves to control the production and distribution of raw, prepared and medicinal opium, morphine, cocaine and their derivatives. These proposals are fully described in the 25 articles of the Convention. Articles 9 to 14 Chapter 3, deal more specially with morphine, cocaine and related products and are of paramount interest to the drug trade as they limit the manufacture and sale of these drugs to medical and strictly legitimate uses. With this object in view the several contracting governments have undertaken to control or cause to be controlled all those who manufacture, import, sell, distribute and export morphine, cocaine and their respective salts.

A practical adherence to the text of the convention will necessitate the enactment of legislation in this country that will, eventually at least, revolutionize the practice of pharmacy.

The Proposed Ruling of the Board of Food and Drug Inspection to regulate the importation and sale of opium, morphine, cocaine, coca, their derivatives and preparations, is reprinted in the

Journal of the American Pharmaceutical Association (1912, v. I, pp. 77–81) and commented on by Mr. Beringer.

An editorial (*Drug Topics,* 1912, v. 27, p. 17), in commenting on the proposed action says: "The Board of Food and Drug Inspection has adopted an unusual policy in sending out a 'tentative F.I.D.' relative to the importation and sale of morphine and other habit forming drugs. We presume the 'tentative' method has been adopted because even the Board itself must recognize the illegality of its proposed decision, which is a typical instance of bureaucratic legislation. We are in sympathy with the Board's ideas in wanting further restriction upon the sale of narcotic drugs, and expect to see further checks put upon their sale; but don't let us forget that this is a Government by law."

METHYL ALCOHOL.—The Berlin Correspondent (*J. Am. M. Ass.*, 1912, v. 58, p. 290) calls attention to a large number of cases of poisoning due to methyl alcohol sold in the form of cheap whisky. Up to December 30, 1911, no less than 161 persons had been taken sick in and immediately surrounding the Berlin Municipal Lodging House, and of this number 71 had died. It was at first supposed that the illness was due to decomposed smoked meat but it was later learned that in most cases at least there had been an intoxication with wood alcohol which had been sold in the saloons of the neighborhood.

An unsigned article calls attention to a number of fatal cases of poisoning, from the ingestion of methyl alcohol, and reviews the literature relating to the toxicity of methyl alcohol.—*Pharm. Zentralbl.*, 1912, v. 53, pp. 46–47.

Güth, Heinrich, reviews the several tests that have been suggested from time to time for the detection and estimation of methyl alcohol in spirituous liquors, tinctures and perfumes.—*Pharm. Zentrlh.* 1912, v. 53, pp. 57–59.

The Vienna Correspondent reports that as a consequence of the numerous fatal casualties in the Municipal Asyl in Berlin where more than 60 lives were lost by the use of adulterated alcohol, the Austrian board of health has just issued an ordinance in which the use of methylated spirit is limited to certain industrial purposes.—*J. Am. M. Ass.*, 1912, v. 58, p. 423.

BRITISH PHARMACOPŒIA.—The Pharmacopœia Committee of the General Medical Council reports that the editors of the new issue of the Pharmacopœia are now engaged in classifying the materials relating to the revision of the text which have accumulated in the committee's hands. The committee have to acknowledge the courtesy of the Council of the Pharmaceutical Society of Great Britain, who have been good enough to make arrangements which have facilitated Professor Greenish's acceptance of this appointment. The editors have submitted for the approval of the committee an outline of the steps they proposed to take for the preparation of a first draft of the revised text.—*Chem. & Drug.*, 1911, v. 79, p. 86.

POST-GRADUATE INSTRUCTION.—An editorial (*Pharm. J.* Lond. 1911, v. 87, p. 777) points out that the Council of Pharmacy has sanctioned arrangements for a course of five lectures on "The Terpenes and Essential Oils," to be delivered at 17 Bloomsbury Square, London, in the Spring of 1912. These will partake of the nature of post-graduate lectures, such as there has at times been a demand for among members of the Society who wished to continue their scientific studies beyond the requirements of the Major Examination and under academic conditions.

EXPERIMENTAL THERAPEUTICS.—Torald Sollmann points out that the treatment of every patient is more or less of an experiment and that much of the criticism that has been published of laboratory experimenters is not well founded. He concludes that clinical experimentation could well afford to follow the canons of other scientific experimentation, granting of course that it is to be made useful from a practical or scientific point of view.—*J. Am. M. Ass.*, 1912, v. 58, pp. 242–244.

DOSES.—The dose of a drug should be based on the age, weight and individuality of the patient and the necessity for a strong action of the drug. The frequency of the dose is determined by the results obtained, by the length of time it takes the drug to be eliminated or cease its action, and the possibility of its causing a cumulative action. Age and weight are the most important factors in determining the dose to be given.—*J. Am. M. Ass.* 1911, v. 57, p. 1368.

SALICYLIC ACID.—An editorial (*J. Am. M. Ass.* 1912, v. 58, p. 116) calls attention to a comprehensive investigation of the relative toxicity of natural and synthetic salicylic acid reported by J. A. Waddell. This report is the first of a series on the pharmacology and therapeutics of salicylic acid and establishes the fact that so far as toxicity to the animals experimented on is concerned there is no demonstrable difference between natural and synthetic salicylic acid.

BORAX.—Johnson, W., calls attention to a sample of "ordinary double refined borax," which contained 99.5 per cent. of real borax and contained as much as 200 parts of arsenic per million. He thinks that borax containing such a large proportion of arsenic is unfitted for use in connection with pharmaceutical preparations and should not be sold for medicinal use.—*Pharm. J.* (Lond.), 1911, v. 87, p. 871.

CALABAR BEAN.—Salway, Arthur H., as the result of a chemical examination of calabar bean, reports the following constituents: alkaloids; physostigmine, physovenine, eseramine; dihydric alcohols; trifolianol, calabarol; glycerides of palmitic, stearic, behenic, oleic, and linolic acids.—*Chem. & Drug.* 1911, v. 79, p. 790.

MALE FERN.—Parry, Ernest J., reports an examination of commercial extract of male fern and concludes that a greater part of the male fern extract of commerce is undoubtedly adulterated with from 30 to 60 per cent. of castor oil.—*Pharm. J.* (Lond.), 1911, v. 87, p. 778.

PAREGORIC.—Sargent, F. Pilkington, outlines the evolution of camphorated tincture of opium. He asserts that paregoric was introduced into medicine by Le Mort, professor of chemistry at Leyden University, early in the eighteenth century. It became very popular, and was introduced into the London Pharmacopœia of 1721 as Elixir Asthmaticum. It appears that camphor was first added to the formula included in the London Pharmacopœia of 1809.—*Pharm. J.* (Lond.), 1911, v. 87, p. 716.

PROPAESIN.—Propyl aminobenzoate is prepared by the esterification of paraminobenzoic acid with propyl alcohol. It occurs as a fine white powder, odorless and nearly tasteless. It is only slightly soluble in water and is not readily wetted by this solvent. When placed on the tongue it produces numbness. It is used as a local anesthetic and analgesic. Internally it is given in doses of from 0.25 to 0.5 Gm.—*J. Am. M. Ass.* 1912, v. 58, p. 34.

SALVARSAN.—Arsenophenol-amin hydrochloride, Arsenobenzol. "606," is now described in New and Non-official Remedies as being marketed in compliance with the rules of the Council on Pharmacy and Chemistry. The description calls attention to the precautions that are to be observed in dispensing this remedy and should go far toward assisting in establishing the limitations for this now well-known remedy.—*J. Am. M. Ass.*, 1912, v. 58, p. 191.

SCARLT RED.—Rae, James, in the *Lancet* reports his experiences with the use of scarlet red and asserts that in upwards of 80 cases this drug has seemed to produce marked improvement within 24 hours. He has noticed that after a time a gritty sediment forms in preparations which seems to show that it is preferable to make them up frequently in small quantities at a time.—*Chem. & Drug.*, 1911, v. 79, p. 959.

SULPHUR.—The *Journal of Industrial and Engineering Chemistry* (1912, v. 4, pp. 131–147) in a report of the proceedings in connection with the conference of the Perkin Medal on Mr. Herman Frasch, presents a comprehensive review of the development of the Louisiana sulphur industry and a no less interesting account of the several accomplishments of the inventive genius who devised the plans for overcoming the difficulties involved and succeeded in revolutionizing the sulphur trade of the world.

VERONAL.—A news note (*Pharm. J.* (Lond.), 1911, v. 87, p. 725) reports a death of a woman, age 38, from an overdose of veronal. An additional case of veronal poisoning (*Ibid.* p. 765) is that of a physician, age 39.

An editorial (*J. Am. M. Ass.*, 1912, v. 58, p. 196) calls attention to several recent articles on the pharmacology of veronal and the causes for the rather numerous cases of fatal poisoning by this drug. While the response of veronal in permissible amounts is ordinarily quite satisfactory the slow excretion of the drug is an element of danger in a repetition of the dose within too brief intervals.

BOOK REVIEWS.

QUANTITATIVE CHEMICAL ANALYSIS. Adapted for use in the Laboratories of Colleges and Schools. By Frank Clowes, D.Sc., and J. Bernard Coleman, A.R.C.Sc. Ninth edition. Philadelphia: P. Blakiston's Sons & Co. 1911. $3.50 net.

The subject matter in this work has been subdivided into eight principal parts. Part I contains an excellent treatment of the various preliminary and general operations which are employed in quantitative analysis. Parts II and III are respectively devoted to gravimetric and volumetric analysis. Part IV contains descriptions of the more complex quantitative estimations. Part V describes the processes of analysis of organic substances and explains the methods employed in the determination of molecular weights. Part VI is devoted to gas analysis. Part VII contains certain typical results of analyses. Part VIII contains descriptions of the processes employed in the preparation of distilled water and various gases, and a discussion on the use of compressed gases.

The book contains 128 illustrations, and has been carefully prepared. It is intended to supplement rather than replace oral instruction and demonstration by the instructor. The work is not only well adapted for laboratory instruction but will be found useful to the analyst as well. It contains a large amount of information on the analysis of inorganic and organic substances, and appears to the writer to be one of the best books on the subject of quantitative analysis. H. K.

FOURTH REPORT OF THE WELLCOME TROPICAL RESEARCH LABORATORIES AT THE GORDON MEMORIAL COLLEGE, Khartoum. Volume A, Medical. Andrew Balfour, M.D., B.Sc., etc., Director. Published for Department of Education, Sudan Government, Khartoum, by Ballière, Tindall and Cox, 8 Henrietta Street, Covent Garden, London, 1911. Depots for North America: United States—Toga Publishing Co., 35 West Thirty-third Street, New York City, Dominion of Canada—Toga Publishing Co., 101 Coristine Building, St. Nicholas Street, Montreal. Vol. A., Medical. $5 net.

It will be recalled by our readers that the Functions of the Wellcome Tropical Research Laboratories, Gordon Memorial College, Khartoum, are: (*a*) To promote technical education. (*b*) To promote the study, bacteriologically and physiologically, of tropical disorders, especially the infective diseases of both man and beast peculiar to the Sudan, and to render assistance to the officers of health, and to the clinics of the civil and military hospitals. (*c*) To aid experimental investigations in poisoning cases by the detection and experimental determination of toxic agents, particularly the obscure potent substances employed by the natives. (*d*) To carry out such chemical and bacteriological tests in connection with water, foodstuffs, and health and sanitary matters as may be found desirable. (*e*) To promote the study of disorders and pests which attack food and textile producing and other economic plant life in the Sudan. (*f*) To undertake the testing and assaying of agricultural, mineral and other substances of practical interest in the industrial development of the Sudan.

The previous reports of the laboratories were published in 1904, 1906 and 1908. Their perusal is necessary to a complete understanding of the research work undertaken in the Sudan, during recent years, into varied and deeply interesting problems upon which much scientific labor has been expended. They contain the facts, observations and discoveries brought to light during the last few years. Unlike the commentaries and digests which are so familiar a feature of the scientific press, these volumes contain the actual record, at first hand, of new contributions to the solution of problems of deep and world-wide import.

Their value is further enhanced by the superb manner in which the knowledge, so laboriously gained, has been presented and illustrated. The expansion of the work of the laboratories and the amount of new material collected during the last few years have rendered it impossible to issue the fourth report in one volume, and the subject matter has, therefore, been divided into two parts. The first part, Volume A, deals with the medical aspects of the work of research. Volume B, which relates to general science, is now in the press, and will be issued shortly. Volume A presents the results of the bacteriological examinations carried out at the laboratories. Pathological and other specimens from a wide area, and illustrative of many forms of endemic disease, have been the subjects of investigation. Important papers have also been contributed on the work of the Sleeping Sickness and Kala-azar Commissions. The fallacies and puzzles met with in the course of blood examination in the Tropics form the subject of an interesting and well-illustrated article. An extended research on fowl spirochætosis has demonstrated the important rôle played by the "infected granule" in this disease. Other papers include records of work on trypanosomiasis, human spirochætosis, kala-azar, forms of cutaneous leishmaniasis, veldt sore, diphtheria, human botryomycosis, veterinary diseases, etc. The interesting notes contained in the previous reports on sanitation in the Sudan are continued.

The price fixed for the reports is as moderate as is consistent with the great cost of production, and any profit made will be devoted by the Sudan Department of Education to a special fund for future publications of the laboratories.

The volume which has just been received, contains 404 pages, including 34 pages of index; 14 colored plates; 44 reproductions of black-and-white drawings; 104 reproductions of photographs and wash drawings; and 12 maps and plans. The following is a summary of the contents:

Introduction—Changes and Plans—The Future of Scientific Work in the Sudan—Sleeping Sickness in the Anglo-Egyptian Sudan—Investigation of Natural Conditions in the Bahr-El-Ghazal—Animal Trypanosomes—*Trypanosoma brucei*—Human Spirochætosis—The Spirochæte of Egyptian Relapsing Fever—Spirochætosis of Sudanese Fowls—Method of Obtaining Blood Aseptically for the Culture of Hæmatozoa in the Tropics—Fallacies and Puzzles of Blood Examination—Kala-azar in the Kassala and Blue Nile Districts and Eastern Sudan—General and Pathological Reports of the Kala-azar Commission—The Alkalinity of the Blood Serum in Kala-azar—*Herpetomonas lygœi*—Descriptions of Cases of Kala-azar, Non-Ulcerating Sore, "Oriental Sore," Parasitic Granuloma, Veldt Sore, *Ulcus tropicum,* Leucoderma—Fevers in the Sudan—Pyrexia—Diphtheria in the Tropics—Some Aspects of Tropical Sanitation—Sanitary Notes—The Water-supply of Towns in the Tropics—Lactose-fermenting Bacilli in Surface Water, etc.—Filtering Properties of the Zeer—Human Botryomycosis—Veterinary Notes—Miscellaneous Notes on Hæmatozoa, Howell-Horrocks Bodies in the Human Blood, Mycetoma, Leprosy, Dysentery, Peculiar Bodies in the Intestinal Lymphoid Follicles of an Egyptian—Routine Work—Index.

Scientists who are familiar with the preceding reports, containing as they do most painstaking and valuable work on tropical diseases and tropical sanitation, will find in the fourth report of the Wellcome Tropical Research Laboratories the same degree of excellence and an equal amount of information. It is refreshing indeed to learn that the various problems resulting from unfavorable conditions in the Sudan are being so assiduously studied with the view of the control of the various diseases and the development of a country of inestimable wealth and with the promise of a great future.

One can have but the highest admiration for the scientists who have gone into this region to study the nature and origin of the diseases, and when one considers how dependent the advance of those nations who have undertaken the civilization and development of the resources of this part of the world, is on the progress in the study of the diseases peculiar to it, one realizes anew the great practical benefits to mankind that come from scientific research. It will be recalled that when Ex-President Roosevelt planned his trip into the heart of Africa it was feared by many who were familiar with the unhealthfulness of the country, with its pestilential areas on every hand, that he might not return to civilization alive let alone a well man. Fortunately he returned to the United States well and with magnificent collections intended to enrich our knowledge of the fauna of a wide section of the African continent, which contribution to science we doubtless owe in part at least to advance in another branch of science. Incidentally it may be mentioned that when

Colonel Roosevelt stopped at Khartoum he visited the Wellcome Tropical Research Laboratories.

We in the United States, and particularly members of the Philadelphia College of Pharmacy, must rejoice that a graduate of this college is devoting much of his means in so worthy an undertaking.

H. K.

Arbeiten aus dem Pharmazeutischen Institut der Universität Berlin. Herausgegeben von Dr. H. Thoms, Achter Band, Mit 1 Textabbzildung, Urban & Schwarzenberg, Berlin und Wein, 1911.

Volume 8 of the annual reports from the Pharmaceutical Institute of the University of Berlin records the work done in the several laboratories during the year 1910. The book in keeping with the previous volumes is a large 8vo of 280 pages and contains 46 separate articles and reports. As in previous volumes the work done in the several divisions of the Institute is reported in collected form for ready reference. The division for the examination of medicines, specialties and secret remedies, presents the usual review of the more important new remedies marketed during the year 1910 and reports on the examination of a number of secret remedies and pharmaceutical specialties. The report of the work of this division takes up 67 pages of the book.

The report of the work of the division of inorganic chemistry includes observations on the practical utilization of pure nitrogen, the determination of perboric acid and similar combinations and a study of the catalytic oxidation of Ammonia.

The report of the work done by the division of organic chemistry is devoted in part to reports on phytochemical observations, Dr. Thoms himself reporting his experienees in the cultivation of Japanese Mint in Germany.

The report of the division for the examination of foods and technical products of the colonies includes 12 papers on the chemistry of various products, mainly from the East African Colonies.

This volume like the seven preceding it, serves to foreshadow the work of pharmacy in the future, and for this reason alone the book should be found in the library of every pharmacist who is interested in the development of his calling, and it should certainly be found in the library of every pharmaceutical school and frequently referred to by teachers as an illustration of the work that can and should be done by students and future pharmacists.

M. I. Wilbert.

THE DECEMBER PHARMACEUTICAL MEETING.

This meeting was held on the 11th, at 3 P.M., in the materia medica lecture room, Mr. E. M. Boring presiding. The first paper was one on "Improvements in Pharmaceutical Apparatus," by J. Percy Remington, B.Sc., P.D. (son of Prof. J. P. Remington). After being introduced by Mr. Boring, Dr. Remington said he was sorry he could not bring his machine with him for making granulated effervescing salts, but as it weighed two tons and was forty feet in length, it was impossible. The working of the machine was, however, described in detail. He then exhibited and described a measuring faucet which he had devised, saying that in a large pharmaceutical establishment many thousand gallons might be lost each year through the evaporation of alcohol, during its handling, and the loss from washing measures, and dippers, etc. The ordinary method used for measuring fluid extracts has first been to draw a ten-gallon measure full, and dip from this to fill the smaller bottles, and the loss of alcohol by this method often causes the precipitation of some of the solid contents. There are a large number of bottling machines on the market, some of which use the bottles to be filled as the measure; this may answer where economy of time is desired, but not accuracy, and the liquid is not valuable. "Float measures" are often used, but the float valve may easily be choked and is difficult to clean. It was desirable to invent a measuring faucet, not too expensive, that could be left on the barrel. Such a faucet that will measure a pint or half a pint, can be built for a cost of less than $1.50. The "Remington" measuring faucet consists essentially of two glass cylinders and a four-way cock. This cock can be set so that a liquid can flow in and not flow out, or so that it can flow in one side, while the other side is emptying. The faucet is very accurate and there is no overflowing, not varying more than three minims in filling a four-ounce bottle. There is no chance for evaporation while using the apparatus. When in use the measured liquid runs into the bottle faster than into the measure. This faucet seems to fill all of the conditions of an ideal measuring faucet. Dr. Remington then spoke of the manufacture of granular effervescent salts. He said that their production from the standpoint of the manufacturer, at the present time, was unsatisfactory. The mass as now generally handled resulting from heating the materials, is pushed through coarse sieves by hand in order to form the granules. These are then put into a drying room over night, or dried by means of a vacuum pan. By this method of manufacture some of the salt is overcooked; there is also much unevenness in the size of the granules, too much fine powder being present, contrasting unfavorably with the granules; to prevent this contrast has resulted in the whole powder being in a finer condition than is desirable. The making of the effervescent salts is really a baking process, the essentials of baking powder being present, the materials being heated and the product put into a drying closet, and then the dough-like material passes through number six tinned iron sieves. In the Remington machine the mixed powder is spread on long belts which pass over heated galvanized metal sheets, isolated by asbestos, the belt moving a foot in half a minute. After its being heated as mentioned, the dough is passed under polished rollers and divided into small cubes by cutters. At the first cutting, pieces the size of a lead pencil are cut off, each of these being afterwards cut into 108 pieces. The machine when in actual use will turn out a ton and a half of granular effervescent salt per day.

Prof. E. Fullerton Cook then spoke on "The Scope of Some of the Proposed Changes in the National Formulary IV." He gave briefly the origin of its predecessor, which was entitled "The New York and Brooklyn Formulary." It was issued in 1884, and afterwards presented to the American Pharmaceutical Association. The plan of the book was conceived by Dr. Chas. Rice, who became its first editor. The First Edition of the National Formulary was issued in 1888, the Second in 1896, the Third in 1906, the latter being made an official standard under the Pure Food and Drugs Act, to the surprise of many, as it had not been intended for a legal standard, there being no tests in the book. The Fourth Edition, it is believed, will be much improved, in style being quite similar to the U. S. Pharmacopœia.

The "Propaganda" movement has helped materially in popularizing the Formulary. The question then may be asked, How will the National Formulary differ from the U.S.P.? In the first place, it will contain formulas not considered of sufficient importance to go into the Pharmacopœia, such as Dobell's Solution, Stoke's Liniment, etc., and this is an acknowledged feature. Another class of preparations will consist of formulas from foreign pharmacopœias, such as Compound Oil of Hyoscyamus, Etherial Tincture of Ferric Chloride. There will also be preparations that were formerly official in the U.S.P., but out of the 117 now in the appendix of the book, only 63 are considered important enough to be retained. The appendix itself is to be abandoned, the preparations now in it that are to be retained, going into the body of the book. There will be about 100 new preparations added. The New National Formulary will give descriptions and tests for all simple substances used in the formulas of the book which are not contained in the U.S.P. Only the metric system of weights and measures will be used.

Dr. C. B. Lowe then exhibited a capsule cleaner, the invention of J. Percy Remington, which had been in use in his store for some years and found of the greatest value in cleansing capsules; as it could be bought for $1, he rather wondered that so few druggists used it, as it was such a cleanly way of cleaning capsules, and was also a great time-saver. Professor Remington spoke of the blot on the National Formulary by its imitation formulas of some of the popular proprietary medicines. It was pointed out that the Pharmacopœia is also not without fault in this respect and that doubtless, with the awakened conscience on this question, all standard books will correct these defects in future editions. Mr. Warren H. Poley said that these proprietary preparations are only substitutes for old-fashioned preparations; he did not think the proprietary medicine manufacturers came with clean hands. On motion the meeting adjourned.

C. B. Lowe.

PHARMACEUTICAL BACTERIOLOGY.

Pharmaceutical Bacteriology.—Prof. Albert Schneider, of the California College of Pharmacy, is the author of an excellent book on "Pharmaceutical Bacteriology." It consists of nearly 250 pages and contains some 14 chapters dealing with the importance of bacteriology to pharmacists, the historical development of bacteriology, the general morphology and physiology of bacteria, range and distribution of bacteria, bacteriological technic, bacteria in the industries, immunity, bacterial activities and bacterial products, the manufacture and use of sera and vaccines, yeasts and moulds, protozoa in disease, disinfectants and disinfection, food preservatives, insecticides, sterilization and disinfection in the pharmacy, communicable diseases with suggestions on preventive medicine and a bacteriological and microscopical laboratory for the pharmacist.

In view of the professional requirements of the pharmacist and the practical importance of a knowledge of the principles of bacteriology by the pharmacist, this work by Professor Schneider is likely to be greatly appreciated by students in pharmacy as well as retail pharmacists. The publishers of the book are P. Blakiston's Son & Co., 1012 Walnut St., Philadelphia. Price $2.00 net.

THE AMERICAN
JOURNAL OF PHARMACY

APRIL, 1912

THE CONSTITUENTS OF SOME CUCURBITACEOUS PLANTS.*

By Frederick B. Power.

A Contribution from the Wellcome Chemical Research Laboratories, London.

In response to a request to contribute a paper to the Pharmaceutical Conference at Sydney, it has been considered that a somewhat comprehensive survey of the results of some recent investigations pertaining to the constituents of a number of tropical or semitropical plants which are used medicinally would not be without some features of interest to those who are engaged in the practice of pharmacy under the Southern Cross.

The particular plants which have been chosen for present consideration are representatives of the natural order of *Cucurbitaceæ*—the so-called Gourd or Cucumber Family. This natural order has been stated to contain nearly 100 genera, comprising about 500 species, which appear to be pretty equally distributed between the eastern and western hemispheres. Although these plants are chiefly natives of hot countries, such as India and South America, a few are found in North America and the north of Europe, while some are also met with at the Cape of Good Hope and in Australia.

The plants belonging to the family of *Cucurbitaceæ* are particularly characterized by the occurrence in them of acrid or purgative principles, and it is for this reason that a considerable number have been employed to a greater or less extent as medicinal agents. On the other hand, many of the species, when cultivated, yield edible and nutritious fruits, such, for example, as the pumpkin and squash, the cucumber, the many varieties of melon, etc.

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* Read before the Pharmacy Section of the Australasian Association for the Advancement of Science, Sydney, N. S. W., January 11, 1911, and extended for the present publication.

In considering those plants, or the parts or products of them, which are known or reputed to possess certain physiological properties, attention may specially be devoted to such as have recently been made the subjects of complete chemical investigation in the Wellcome Chemical Research Laboratories, London. In this connection it would appear of interest to note that of the drugs under present consideration, elaterium, pumpkin seed, watermelon seed, and bryony root were recorded in the inventory of a pharmacy at Frankfort-on-Main, Germany, dating from about the year 1450. All of the above, together with colocynth pulp (*Colocynthidis pulpa*), were likewise noticed in the *Dispensatory* of Valerius Cordus, first published in 1546, which affords further evidence that these simple drugs were kept by the apothecaries and used medicinally at a very remote period (compare Tschirch, *Handbuch der Pharmakognosie*, 1910, Bd. I, pp. 576, 798).

ELATERIUM.

The product known as *Elaterium* is at present recognized by but few of the national pharmacopœias. It is, however, still retained in the British Pharmacopœia, where it is defined as "a sediment from the juice of the fruit of *Ecballium Elaterium*, A. Richard."

The history of this drug indicates it to have been employed in ancient times, for it is recorded (*Pharmacographia*, 2d edit., p. 292) that "Dioscorides explicitly describes (about A.D. 77 or 78) the singular process for making elaterium, which was almost exactly like that followed at the present day." It is also noted in the *Pharmacographia Indica*, Vol. II., p. 96, that "the Mahometan writers attach considerable importance to elaterium as a purgative of the diseased humours which they suppose to be the cause of a great number of diseases."

Although the administration of a drug possessing such drastic purgative properties as elaterium is seldom indicated, its comparatively rare employment in modern medicine is probably also attributable in part to its variable character and consequent uncertainty of action. This difficulty was supposed to have been overcome by the use of the chief crystalline constituent of the drug, the so-called elaterin, which was regarded as its active principle, and has therefore been officially recognized by both the British and United States Pharmacopœias.

In the course of a recent chemical examination of elaterium[1] some quite unexpected and interesting results were obtained. The material employed for this purpose consisted of the best English elaterium, which conformed in its general characters to the requirements of the British Pharmacopœia. After having isolated the crystalline product known as elaterin, it was subjected to a prolonged process of fractional crystallization, when it was observed not to be homogeneous, but to consist, to the extent of 60–80 per cent., of a substance which is completely devoid of purgative action. This substance which, in its optical behavior, is laevorotatory, is accompanied in the crude elaterin by a substance of apparently the same percentage composition, but which possesses strongly purgative properties and is dextrorotatory. An examination of the crystalline elaterin of commerce, both of English and German manufacture, showed that this likewise was not of uniform composition, but that it varied considerably in its physical characters and consequently in its physiological action, for the latter, as already indicated, depends upon the proportion of dextrorotatory substance present.

With consideration of the results above described, it was subsequently deemed desirable to make a complete examination of the fresh fruits of *Ecballium Elaterium*,[2] especially as a previous investigator[3] had affirmed that elaterin does not exist in the fruit as such but in the form of a glucoside. In the course of this research it was found, however, that the elaterin is present in a free state, and, furthermore, that various other products which had heretofore been regarded as definite constituents of the fruit, such as the so-called prophetin, ecbalin or elateric acid, hydro-elaterin, and elateride, which were mostly amorphous, must have consisted of complex mixtures (compare Gmelin's *Handbook of Chemistry*, vol. xvii (1866), pp. 364–367).

Having ascertained that elaterin as found in commerce, and as recognized by the British and United States Pharmacopœias, is a mixture of two substances, possessing widely different properties, it was evidently important that these substances should receive distinctive names. It was therefore proposed to designate the predominating constituent of crude elaterin, which is laevorotatory, as α-elaterin, and the physiologically active, dextrorotatory constituent as β-elaterin.

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[1] Power and Moore, *Pharm. Journ.*, 1909, **83**, pp. 501–504.

[2] Power and Moore, *Journ. Chem. Soc.*, 1909, **95**, pp. 1985–1993. Compare also Moore, *Ibid.*, 1910, **97**, pp. 1797–1805.

[3] Berg, *Bull. Soc. Chim.*, 1897 [iii], 17, p. 85.

On account of the very small proportion of β-elaterin contained in crude elaterin, it has not, as yet, been found practicable to obtain it in a pure state, and, in an undiluted form, it would doubtless be too potent a remedy for medicinal use. On the other hand, it would appear to be possible to standardize elaterin in such a manner as to secure uniformity with respect to the proportion of its physiologically active constituent, and consequent certainty of action when administered in definite doses. This could doubtless be most easily and satisfactorily accomplished by the adoption of such a standard for its specific optical rotation as would insure the presence of a sufficient proportion of the physiologically active β-elaterin.

COLOCYNTH.

Colocynth, or "Bitter Apple," as it occurs in commerce, consists of the dried, peeled fruit, or the pulp of the fruit, of *Citrullus Colocynthis,* Schrader. This fruit has been known and used medicinally from the earliest times, being mentioned in the writings of Theophrast, Dioscorides, and Pliny (compare *Pharmacographia Indica,* Vol. II., p. 61), and its value would appear to be attested by the fact that it is still recognized by all the national pharmacopœias. Under these circumstances it may be considered somewhat remarkable that, until quite recently, so little of a definite nature has been known respecting the constituents of colocynth. It was stated, for example, many years ago by Walz [4] that this fruit contains a bitter glucoside, designated "colocynthin," which, on boiling with dilute acids, became resolved in another amorphous compound, termed "colocynthein," and dextrose. A crystalline, tasteless substance, named "colocynthitin," has likewise been stated to occur in the fruit, but it was not further characterized.

Although in the intervening years colocynth has attracted the attention of several investigators, their results were more or less conflicting, and could not be considered as having satisfactorily elucidated the nature of its active constituents. Thus Henke [5] could obtain a product corresponding to the so-called colocynthin only in the form of an amorphous powder, and was unable to confirm the statement of Walz respecting its glucosidic character. Johannson,[6] on the other hand, has stated that "colocynthin," when heated with dilute sulphuric acid, yields colocynthein, elaterin, and bryonin, and some color reactions were recorded which were supposed to differentiate these products. More recently, Naylor and Chappel,[7] in an examination of the fruit of *Cucumis trigonus,* Roxb.[8] (*C. Pseudocolocynthis,* Royle), have taken consideration of the characters of the so-called colocynthin. They were led to conclude that colocynthin is capable of crystallizing, and that it is glucosidic, yielding on hydrolysis, amongst other products, colocynthein, elaterin, and dextrose. Their conclusions were, however, chiefly based on certain color reactions, which are by no means characteristic of the substances they were assumed to identify.

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[4] *N. Jahrb. Pharm.,* 1858, **9**, pp. 16, 225; 1861, **16**, p. 10.

[5] *Arch. d. Pharm.,* 1883, **221**, p. 200.

The various discrepancies in the results obtained by the abovementioned investigators may readily be explained, for it is quite obvious that the products described by them did not represent pure compounds, but consisted of more or less indefinite mixtures. With consideration, therefore, of the unsatisfactory state of knowledge respecting the constituents of so important a drug, it was deemed desirable to subject colocynth to a complete examination. The results of the investigation conducted in these laboratories,[9] for which purpose a good quality of Turkish colocynth was employed, may in this connection briefly be noted.

The pulp of the fruit, which, when deprived of the seeds, amounted to 24.5 per cent. of the whole, was completely extracted with hot alcohol, and the resulting extract distilled in a current of steam, when a very small amount of an essential oil was obtained. From the portion of the extract which was soluble in water, the following substances were isolated: (1) a new, crystalline, dihydric alcohol, $C_{22}H_{36}O_2(OH)_2$ (m.p. 285–290°), which has been designated citrullol; (2) an amorphous, alkaloidal principle, which possesses an extremely bitter taste, and represents one of the purgative principles of the fruit. The aqueous liquid contained, furthermore, a quantity of inorganic salts, a little sugar, and a very small amount of an amorphous, glucosidic substance.

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[6] *Zeitschr. Analyt. Chem.,* 1885, **24**, p. 154.

[7] *Pharm. Journ.,* 1907, **79**, p. 117.

[8] *Cucumis trigonus,* Roxb., which is indigenous to India (compare *Pharmacographia Indica,* Vol. II, p. 65) has been noted by Mr. J. H. Maiden, F.L.S., Director of the Botanic Gardens, Sydney, as being also a native of New South Wales, Queensland, and Northern and Western Australia (*Pharm. Journ.,* 1899, **63**, p. 16).

[9] Power and Moore, *Journ. Chem. Soc.,* 1910, **97**, p. 99.

The substance designated citrullol is of special interest, inasmuch as it is a member of a group of dihydric alcohols which form an homologous series, represented by the general formula $C_nH_{2n-6}O_4$. The other known members of this group, which were likewise isolated in these laboratories, are: ipuranol, $C_{23}H_{38}O_2(OH)_2$, which was first obtained from the stems of *Ipomœa purpurea,* Roth,[10] but has since been found to be a constituent of numerous other plants, and trifolianol, $C_{21}H_{34}O_2(OH)_2$, which was first isolated from red clover flowers,[11] subsequently from the flowers of the carnation clover,[12] and quite recently from Calabar beans.[13]

The portion of the above-mentioned alcoholic extract which was insoluble in water consisted chiefly of resinous material, but from it a quantity of α-elaterin,[14] $C_{28}H_{38}O_7$ (m.p. 232°; $[\alpha]_D -68.9°$) was isolated. On subsequently extracting the resin with various solvents, it yielded, furthermore, a small amount of hentriacontane, $C_{31}H_{64}$; a phytosterol, $C_{27}H_{46}O$ (m.p. 160–162°); a mixture of fatty acids, and an additional amount of α-elaterin, together with a little of the above-described alkaloidal principle. The ether and chloroform extracts of the resin possessed marked purgative properties.

The seeds of the colocynth, which amounted to 75.5 per cent. of the entire peeled fruit, were extracted with light petroleum, when they yielded 12.7 per cent. of their weight of a fatty oil. The latter was found to agree very closely in character with the oils from some other cucurbitaceous seeds, such as those of the pumpkin and watermelon, which will subsequently be described. The colocynth seeds also contain a small amount of an enzyme which hydrolyses β-glucosides, and traces of an alkaloidal principle, which is probably identical with that contained in the pulp of the fruit.

The results of the recent research on the constituents of colocynth have, on the one hand, afforded conclusive evidence that the so-called "colocynthin" and "colocynthitin" of previous investigators were not homogeneous, but consisted of mixtures of a very indefinite character, and that the amount of glucosidic substance contained in the fruit is extremely small. On the other hand, it has been shown that the purgative action of colocynth is due to at least two compounds, one of which is alkaloidal, although a very weak base and apparently incapable of crystallizing or forming crystalline salts, whilst the other source of activity is represented by some principle or principles contained in both the ether and chloroform extracts of the resin. The attempts to obtain the last-mentioned active principles in a more definite state were unsuccessful.

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[10] Power and Rogerson, this Journal, 1908, **80**, p. 264.

[11] Power and Salway, *Journ. Chem. Soc.,* 1910, **97**, p. 249.

[12] Rogerson, *Ibid.,* 1910, **97**, p. 1014.

[13] Salway, *Ibid.,* 1911, **99**, p. 2154.

[14] Power and Moore, *Ibid.,* 1909, **95**, p. 1989.

Pumpkin Seed.

The seeds of the common pumpkin (*Cucurbita Pepo,* Linné) are chiefly of interest on account of their reputed value as a tænifuge, and it is evidently for this reason that they have long been officially recognized by the United States Pharmacopœia. Although the seeds are usually administered in the form of the bruised kernels, in doses, for an adult, of 100 to 200 grammes, their action has been variously attributed to both the fatty oil and the resin which they contain. In order to ascertain whether any definite active principle is present in the seeds, they were subjected to a complete chemical examination,[15] and the products, so far as practicable, submitted to physiological or clinical tests.

The kernels of the seed yielded, on expression, an amount of fatty oil equivalent to 19.3 per cent. of the weight of the entire seed. When, however, the entire seed were ground, and extracted with light petroleum, the yield of oil amounted to 34.3 per cent. of their weight. This fatty oil, which, when viewed in layers of moderate thickness, had a cherry-red color with a marked fluorescence, was found to consist of the glycerides of linolic, oleic, palmitic, and stearic acids, together with a very small amount of a phytosterol, $C_{27}H_{46}O$. The resinous material, as extracted from the press-cake, amounted to only about 0.5 per cent. of the weight of the entire seed. Neither the fatty oil, in amounts of 15 to 60 c.c (about half a fluidounce to two fluidounces), nor the resin, in amounts of 1 gramme (representing about 200 grammes of the seed), were found to effect the complete removal of tape-worm, when administered to different individuals under the usual conditions of fasting and followed by a dose of castor oil.

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[15] Power and Salway, *Journ. Amer. Chem. Soc.*, 1910, 32, pp. 346-360.

In view of the above-mentioned results, and the fact that pumpkin seed contain no principle which exhibits marked physiological activity,[16] it could only be concluded that any value which they may actually possess as a tænifuge, when administered in substance, must be attributable to a mechanical action. In any case, the remedial value of pumpkin seed cannot be considered such as to justify their recognition by a national pharmacopœia.

WATERMELON SEED.

The seeds of the common pumpkin having been subjected to a complete chemical examination, as already noted, it was deemed desirable also to examine those of the watermelon (*Cucurbita Citrullus,* Linné),[17] since the latter have been employed to some extent medicinally on account of the diuretic properties attributed to them, although chiefly as a domestic remedy.

Nothing, hitherto, appears to have been known respecting the constituents of watermelon seeds beyond the fact that they contain a fatty oil, of which the physical and chemical constants have been recorded, as also those of the mixed fatty acids obtained therefrom (compare Lewkowitsch, *Chemical Technology and Analysis of Oils, Fats, and Waxes,* 3d edit., Vol. II., p. 511).

The kernels of the seed yielded, on expression, an amount of fatty oil equivalent to 7.4 per cent. of the weight of the entire seed. When, however, the entire seed were ground, and extracted with light petroleum, they yielded 19 per cent. of oil The expressed oil, unlike that from pumpkin seed, possessed a yellow color, and was completely devoid of fluorescence. On the other hand, the physical and chemical constants of watermelon seed oil approximate very closely to those of pumpkin seed oil. As might, therefore, be expected, the two oils are very similar in composition, consisting, as noted in connection with pumpkin seed oil, of the glycerides of linolic, oleic, palmitic, and stearic acids.

From the press-cake an amount of resinous material was obtained corresponding to about 0.3 per cent. of the weight of the entire seed. This resin was found to exhibit no physiological activity when administered to a dog in doses of 1 gramme. A chemical examination of the resin led, however, to some results of interest, inasmuch as it yielded, besides a little phytosterol, a new crystalline alcohol, $C_{24}H_{40}O_4$ (m.p. 260°), which has been designated cucurbitol. This compound will be further noticed in connection with the constituents of bryony root.

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[16] The expressed oil of pumpkin seed is largely used for culinary purposes in Austria, Hungary, and Russia (compare *Journ. Soc. Chem. Ind.*, 1898, **17**, p. 1054, and Lewkowitsch, *loc. cit.*, p. 509), whilst the press-cake has been recommended as a food for cattle (Hager's *Handbuch*, 1900, Bd. I, p. 978).

[17] Power and Salway, *Journ. Amer. Chem. Soc.*, 1910, **32**, pp. 360–374.

BRYONY ROOT.

Bryony root has been used medicinally from a very remote period on account of its purgative properties (compare Tschirch, *Handbuch der Pharmakognosie,* 1910, Bd. I, pp. 576, 798). It was formerly recognized by several of the national pharmacopœias, including that of the United States, but was omitted from the latter in the eighth revision (1900), and is now rarely employed. The plants yielding this root are *Bryonia alba,* Linné, and *Bryonia dioica,* Linné, both of which are indigenous to the greater part of Europe, but the last-named species is the only one commonly found in England, and, therefore, is frequently designated English bryony.

Bryony root has previously been the subject of several investigations, chiefly for the purpose of determining the nature of its active constituent (compare Husemann, *Die Pflanzenstoffe,* 2d edit., p. 1349, and van Rijn, *Die Glykoside,* p. 463), but until quite recently [18] no complete examination had been made of it. According to the earlier investigators, the root contains an amorphous, bitter glucoside, designated as bryonin. As obtained by Masson,[19] this product was stated to possess the formula $C_{34}H_{48}O_9$, and, on heating with dilute sulphuric acid, to become resolved into dextrose and an amorphous, yellow resin, termed bryogenin, $C_{20}H_{38}O_4$. Another product obtained by Masson, which was of a purely resinous nature, was named bryoresin, and to this the formula $C_{37}H_{68}O_{18}$ was assigned. A consideration of the method of preparation and characters of the above-mentioned products, as described in the literature, renders it evident, however, that they could not have represented pure or homogeneous substances.

The material employed for the investigation conducted in these laboratories consisted of the roots of *Bryonia dioica,* Linné, which had been specially collected in districts near London, under the supervision of a competent botanist. The details of this investigation have already been recorded (*loc. cit.*), and therefore only a brief summary of the results obtained need here be given.

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[18] Power and Moore, *Journ. Chem. Soc.,* 1911, **99**, pp. 937–946.

[19] *Journ. Pharm. Chim.,* 1893 [v], **27**, 300.

The amount of fresh root collected was 107.5 kilogrammes, and this, after being sliced and dried, weighed 25.5 kilogrammes, the loss on drying having thus been equivalent to 76.3 per cent. of the original weight.

The root was found to contain an enzyme, which was obtained in the form of a light brown powder. This product slowly hydrolysed the glucosidic constituent of the root, and also effected the hydrolysis of amygdalin and salicin.

For a complete examination of the constituents of the root, 23.9 kilogrammes of the dried and ground material were extracted with hot alcohol. The resulting extract, when distilled in a current of steam, yielded a small amount of a pale yellow essential oil. From the portion of the extract which was soluble in water there were isolated: (1) a small amount of a colorless, crystalline, neutral substance (m.p. 220–222°), which appears to possess the formula $C_{20}H_{30}O_5$; (2) an amorphous, glucosidic product, having a brown color and a bitter taste; (3) an amorphous, alkaloidal principle, possessing a brownish-yellow color and an intensely bitter taste. The aqueous liquid contained, furthermore, a quantity of sugar, which yielded *d*-phenylglucosazone (m.p. 208–210°).

The portion of extract which was insoluble in water consisted of a dark brown, viscid resin, amounting to about 2 per cent. of the weight of dried root employed. From this resin the following compounds were isolated: (1) a phytosterol, $C_{27}H_{46}O$ (m.p. 137°), which was optically inactive; (2) a new dihydric alcohol, bryonol, $C_{22}H_{34}O_2(OH)_2$ melting at 210–212°; (3) a mixture of fatty acids, consisting of oleic, linolic, palmitic, and stearic acids.

The compound designated as bryonol is of particular interest, inasmuch as it belongs to a group of dihydric alcohols which form an homologous series, represented by the general formula $C_nH_{2n-8}O_4$. The other known members of this group, all of which were isolated in these laboratories, are as follows: ipurganol, $C_{21}H_{32}O_2(OH)_2$, from jalap resin;[20] grindelol, $C_{23}H_{36}O_2(OH)_2$, from the resin of *Grindelia camporum*, Greene;[21] and cucurbitol, $C_{24}H_{38}O_2$

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[20] *Journ. Amer. Chem. Soc.*, 1910, 32, p. 89.

[21] *Proc. Amer. Pharm. Assoc.*, 1907, 55, p. 342.

$(OH)_2$, which, as already noted, was obtained from the resin of watermelon seed.[22]

In the course of the recent investigation of bryony root it was ascertained that both the above-mentioned glucosidic product and the alkaloidal principle, as well as the aqueous liquid from which they had been removed, were abundantly precipitated by tannic acid. It follows, therefore, that the preparations obtained by previous investigators by means of this reagent, which were regarded as a glucoside, and designated "bryonin," must have consisted of complex mixtures, the constituents of which, moreover, were not entirely glucosidic. The various chemical formulæ that have been assigned to these amorphous compounds are accordingly quite fallacious.

Physiological tests conducted with the above-mentioned products have rendered it evident that the activity of bryony root cannot be attributed to a single definite principle. Its purgative property appears to reside chiefly in the resinous and alkaloidal constituents; the crystalline principle, $C_{20}H_{30}O_5$, and the glucosidic product having been found to be quite inactive when administered to dogs in doses of 0.1 gramme. The assumption of previous investigators that the active principle of bryony root is a glucoside, has thus been shown to be incorrect.

In conclusion it may be noted that there are a number of other cucurbitaceous plants besides those here considered which, on careful chemical examination, would doubtless be found to possess constituents of interest. On the other hand, it is apparent that the plants of this family represent but a very small part of the field of organic *materia medica* which still remains to be explored.

TRAGACANTH—ITS SOPHISTICATION WITH ANOTHER GUM.

By H. C. Fuller
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The substitution and adulteration of powdered tragacanth, with a substance known to the trade as Indian gum, has been practiced for several years, beginning about 1904–1905, and has assumed large proportions. It is a profitable line and works severe hard-ships on the dealer in true tragacanth, because the unpowdered spurious gum is imported at a price several times cheaper than the grades of tragacanth used for powdering, and when powdered it is sold at a handsome profit, yet at a figure low enough to prevent competition from tragacanth. It costs the importer 4–10 cents per pound, depending on the quality, and tragacanth costs from 25–80 cents per pound.

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[22] *Journ. Amer. Chem. Soc.*, 1910, 32, p. 367.

Tragacanth gum is obtained from the shrubs of the Astragalus genus, the gum bearing species yielding products which resemble one another closely in physical and chemical characteristics. There are several gums known as Indian gum, but none of these are obtained from any species of Astragalus. The name *kuteera*, *katirah* and the same with many other spellings, has been applied to some of the Indian gums and to certain of the Astragalus products, the gums from A. heratensis and A. strabilifera, and it has no special significance and does not indicate the origin or proper classification of the gum. While it is possible that the Indian gum used so extensively in this country may vary as to its origin, the specimens examined in the whole condition correspond with samples of gum Sterculia urens submitted directly from India and from London. Furthermore, in a private report submitted from Bombay it is stated that S. urens is the source of this gum, and that it is used as a substitute for tragacanth in the government hospitals in Bombay.

True tragacanth is a product of Turkey, Asia Minor and Persia, the Syrian or Aleppo tragacanth is exported principally from towns on the coast of Syria, such as Beirut, the Persian gum sometimes comes through this port, but is generally shipped down the Tigris and thence eastward, through the Persian Gulf, the Turkey tragacanth is shipped from Smyrna and Constantinople. All of these varieties reach the Hamburg and London markets, and while some shipments are made direct, most of the gum comes from these two ports to the United States. It has been received in small amounts from India, but it is probable that even this gum had its origin in Persia.

The substitute gum in the whole condition has none of the physical characteristics of tragacanth. It occurs in striated irregular lumps, sometimes twisted, transparent or transulcent and not in ribbony bands like tragacanth. As it reaches this country it often contains considerable bark which is bolted out before the powdered material is ready for the market. The powder is usually very white, rivalling in appearance that of the best grades of tragacanth. The bark contains characteristic stone cells which pass into the powder, and serve as a means of identifying the source of the product. Tragacanth bark contains no substance of similar character.

If the product is a straight substitution there is little difficulty in distinguishing it from pure tragacanth. The powder of the spurious article forms a nearly transparent jelly with water, swelling up to a considerable bulk and apparently dissolving, though, as a matter of fact, a small portion only is taken into solution. The aqueous mixture is decidedly acid to litmus. It is unaffected by iodine solution which becomes blue in the presence of true tragacanth, and it does not give a yellow color when warmed with alkali; in fact, when there is a straight substitution and no added starch, the pharmacopœial tests for tragacanth will indicate the fraud. When an aqueous mixture of this gum is boiled with dilute hydrochloric acid, a clear solution with a marked pink color results, tragacanth under like treatment dissolves only in part, a large mass of flocculent material settles out, leaving a brown supernatant liquid. In the case of a mixture of this gum with tragacanth, the examination becomes more complicated, for such a product will answer the pharmacopœial chemical tests for tragacanth, and one has to resort to other reactions in order to determine the character of the original material before it was powdered. In admixtures of this type the microchemical test will indicate the presence of the spurious gum, even when the proportion is quite small. Indian gum reacts in a peculiar manner with borax, referred to at some length by Scoville,[1] which property is of value in detecting mixtures. Tragacanth gives a smooth creamy mixture while the substitute gives a thick slimy mass, often so gelatinous that it will not pour out of the container, this property being apparent even in presence of considerable amounts of tragacanth. The test is best performed by placing 2 grams of the powder in a 100 c.c. graduated cylinder, moistening with alcohol and adding about 50 c.c. water, shaking until an homogenous mixture is obtained; 2 grams of borax are dissolved in 50 c.c. water, added to the jelly; the whole well shaken and allowed to stand over night. When pure tragacanth alone is under examination, the resulting mixture will pour out of the cylinder without stringing, while if Indian gum is present a stringy mixture results. Another important property of the new gum is the separation of volatile acids, largely acetic, on boiling with mineral acids; tragacanth, treated in the same way gives a distillate which is slightly acid, but the amount is much smaller than that obtained with Indian gum. It has been found that the amount of acid given off by specimens of Sterculia urens collected at random is quite constant, and the acidity of a sample under examination will furnish a very reliable figure for estimating the amount present.

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[1] Druggists Circular 1909, 116-17.

THE RESULTS OF THE EXAMINATION OF FORTY-SEVEN SAMPLES OF OLIVE OIL.

By J. R. Rippetoe and N. Smith.

The determination of the iodine number of olive oil affords one of the best tests for the establishment of its purity The results of the examination of 47 samples will no doubt be of interest since the iodine number of many of the samples was found to be below 80; the U. S. P. requirement being not less than 80 nor more than 88. Otherwise the samples complied with the requirements and were considered of good quality for medicinal or edible purposes with several exceptions where the amount of free acid was high.

No appreciable difference in the results was obtained by varying the excess of iodine, time of standing (4 to 16 hours) and temperature.

All determinations were made in duplicate, the mean reported, and if there were variations of more than 1.0 another assay was made. Eight ounce Erlenmeyer flasks with rubber or cork stoppers (cork preferred) were used and found more satisfactory than glass stoppered flasks.

Sample No.	Marks or source.	sp. gr. 25/25°C.	Sap. No.	Iod. No.	Free Acid as oleic per cent.
3689		.9113	192.5	82.4	
3690		.9114	191.5	78.8	
3691		.9115	190.5	78.6	
3704	Italian, Lucca	.9126	191.0	81.1	0.80
3710		.9114	191.3	80.7	10.00
3747		.9121	189.0	80.0	
2539	Candia, Trieste	.9119	190.4	78.4	3.2
4011		.9116	192.6	80.4	
4064		.9118	195.2	80.6	10.7
4064½	Corsican	.9124	194.5	83.9	0.86

6233	Italian, Lucca	.9115	192.0	81.0	
7578		.9110		84.5	1.36
7697		.9112	191.4	81.3	
7698	Italian	.9117	192.7	81.5	
7858		.9119	192.0	77.9	
8169		.9121	191.9	78.6	
8182		.9115	192.2	77.4	
8216	Extra Cream Salad	.9121	191.7	83.5	
8217	Italian, Lucca	.9122	192.2	84.4	
8479		.9116	193.8	82.7	0.96
8480		.9116	193.6	83.6	2.17
8481		.9111	194.7	86.0	5.49
8482	Italian, Lucca	.9111	193.6	85.3	1.38
8535	Italian, Lucca	.9124	193.5	81.9	1.67
8848		.9106	190.7	80.2	
9689		.9123	191.4	89.4	
9696		.9120	191.7	84.3	
9727		.9114	192.7	80.5	
9728		.9113	191.5	80.5	
9729	Spanish	.9116	190.8	80.4	1.05
9730	Spanish Virgin	.9116	191.3	80.6	1.55
9731	Italian, Lucca	.9114	190.3	80.0	1.61
9788		.9106	191.4	79.0	2.87
9789		.9109	191.6	77.6	1.18
9803	Italian	.9105	191.7	77.7	2.47
9806	Turkish	.9109	192.2	78.5	0.59
9818	Italian, Lucca	.9112	191.4	79.1	1.14
9928		.9134	191.9	81.1	1.11
9874		.9129	194.7	81.0	0.87
9875		.9124	191.0	80.9	1.13
9876	French	.9120	189.6	81.2	0.96
9885	Italian, Lucca	.9118	190.4	79.5	1.00
9886	Italian	.9119	192.0	80.0	1.23
9887	"	.9111	190.9	80.5	1.24
9947	"	.9111	192.4	77.2	0.73
9948	"	.9111	191.2	77.4	1.92
9973	Spanish	.9117	192.2	81.2	1.10

Iodine number, minimum 77.4; maximum 89.4; average 80.9.

We are of the opinion that the limit 80 is too high, and that oils of the best quality may be condemned if held to this requirement. We believe it advisable to establish a limit for free acid (calculated to oleic) in the U. S. P.

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PURIFIED CARAMEL AND THE STANDARDIZING OF CARAMEL SOLUTIONS.[1]

By George M. Beringer.

The desire of the committee engaged in the revision of the National Formulary, to provide for preparations of uniform color wherever prepared if made in accordance with the Formulary recipes, has occasioned considerable study. This problem has been especially referred to a subcommittee on color standards whose reports have aroused considerable interest among those outside of the committee as well as the members thereof.

The colorings most commonly used by pharmacists in elixirs, syrups, etc., at the present time, are caramel and cudbear. The attempt to standardize such indefinite substances has not proven an easy task and while a number of methods have been proposed, opinion has not yet crystallized into a conclusion that any of those proposed has entirely and satisfactorily solved the problems.

In the present communication the writer will confine himself to the consideration and review of the various propositions relating to caramel and leave the consideration of the problems relating to cudbear for another occasion.

Caramel is a complex mixture of a number of organic compounds produced by heating sugars to a temperature high enough to produce dark brown colorings without charring and. after the tumefaction has ceased, adding water. It is believed that it is now produced on the commercial scale entirely from starch sugar or glucose.[2] For the purpose of this communication it is unnecessary to enter into a detailed discussion of the chemistry of caramel. It is sufficient to state that it contains several coloring substances, an odorous principle separable by distillation, usually some undecomposed sugar, and a trace of caramelan, a highly hygroscopic substance having a bitter taste and colorless when pure and varying proportions of water. The gravity usually ranges between 1.300 and 1.390; according to Wagner, the manufacturer usually aims at 35° Baume =

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[1] Read before the Philadelphia Branch of the American Pharmaceutical Association Tuesday evening, February 6, 1912.

[2] For details of the commercial methods of manufacturing Caramel see Frankel's translation of Wagner's work on Starch, Glucose, Starch Sugar, etc.

1.312 at 15° C. The ash is usually quite small, rarely over 10 mg. per gram, and this commonly consists of sodium salts, chloride, sulphate and carbonate.

On heating sugars to the temperature necessary to produce caramel several dark colored bodies are produced, some of which are soluble and others insoluble in either water or alcohol, and at least one of these colored substances so produced requires for solution the presence of alkali or alkali carbonate and for this reason the manufacturer adds sodium carbonate or ammonium carbonate or ammonia in the process of manufacture. There is also usually produced a small amount of a brown colored lustrous substance not soluble in any of these solvents.

The writer has recently attempted to review and test out the various suggestions that have been offered as a means of standardizing caramel and its solutions. This work has led him into experiments along certain lines not covered by the other investigators.

One of the first propositions made was, that in order to obtain uniformity, the pharmacist should prepare his own caramel and formulas for this purpose were proposed. The initial proposition presented in the *Bulletin of the American Pharmaceutical Association,* December, 1909, page 479—" is to heat 1 pound of Sugar on the sand bath at 180° C. for 2 hours and dilute it to 1 pint." All of the authorities are agreed that on heating sugar to this temperature and cooling there is formed the allotropic modification of cane sugar known as " barley sugar." However, I tried the suggestion and, as was to be expected, obtained a mass with scarcely any darkening and which could in no way be considered as caramel.

A later suggestion offered (Bulletin of N. F. Committee No. 31—page 364) was " sugar 1000 Gm., water a sufficient quantity. Heat the sugar in an appropriate vessel on a sand bath at 200° C. for 2 hours. Then add to the caramelized fluid enough boiling water to make the finished product measure 1000 c.c." This product was to be standardized by requiring that—" 1 c.c. of this diluted with 399 c.c. of distilled water should have the same intensity of color as the Standard Caramel Testing Solution." The standard test solution was Stevens' Standard which will be referred to later. The adjustment of the caramel to the standard was obtained by either dilution or concentration whichever was required.

A test of this method showed that it did produce more or less caramel, but that for the complete caramelization of the sugar a somewhat higher temperature 210° to 215° was necessary. The resulting product was treated with several portions of boiling distilled water, the solution filtered and concentrated to the volume directed in the formula and this compared with a good commercial sample of caramel was deficient in tinctorial power and had to be further concentrated to obtain a liquid comparing with the standard proposed. The residue on the filter and in the dish was then washed with a warm weak solution of sodium carbonate and this yielded a dark brown solution of the coloring insoluble in the water alone.

A practical difficulty arises in carrying out this formula for caramel. On heating sugar to the temperature necessary odorous vapors and fumes are given off that fill the entire building and unless made under a hood connected with a good draught the manufacture of caramel would be impracticable and the average pharmacist could certainly not make it satisfactorily or economically. The resulting product as made on the small scale by different individuals will also vary considerably in composition.

There is still another phase of the subject that must be considered. If the National Formulary introduces a formula for Caramel, then that formula even though it is not in keeping with the commercial process becomes the legal formula and the product, even though inferior, becomes the legal standard for all caramel. This might prove a very serious source of annoyance and trouble to other industries in which the consumption of caramel is vastly greater than in pharmacy. For this reason I am constrained to believe that the proposition that the N. F. should introduce a formula for Caramel and that the pharmacist should prepare his own is untenable.

For Tincture of Caramel a formula has been proposed in the Bulletin of the N. F. Committee No. 31—page 365—to be made as follows:

" Caramel	100 gm.
Alcohol and water	each a sufficient quantity.

" Dissolve the Caramel in such quantity of Alcohol 1 volume and Water 3 volumes as may be necessary so that 1 c.c. of the tincture when diluted with Water to 100 c.c. shall have the same depth of color as a standard solution prepared in accordance with the Stevens' Standard Caramel Testing Solution." The standard test solution proposed by Professor Stevens is as follows:

"Place 0.5 Gm. sugar in a dry test tube 20 mm. diameter. Immerse the tube to a depth of 5 cm. in a sulphuric acid bath, previously heated to 210° C. and keep at that temperature for 20 minutes. Remove the tube and when cold dissolve in sufficient water to make 200 c.c. Add 50 c.c. alcohol and sufficient water to make exactly 250 c.c."

Several of the members who experimented with this formula claim that concordant results were not always obtained and that the width of the test tube and the degree of immersion in the bath as well as the quality of sugar used materially altered the results. The objections to sulphuric acid as a bath was met by a suggestion from Mr. Otto Raubenheimer that a bath of petrolatum be substituted therefor. As a result of my experimenting with this formula following out carefully the directions as to the amount of sugar, size of test tube, etc., I was enabled to obtain fairly uniform results. I prefer, however, to use a cotton seed oil bath to either sulphuric acid or petrolatum. On carrying out this test strictly in accordance with the instructions and attempting to dissolve the caramel in water it was found that the mass clung tenaciously to the test tube and was removed with difficulty. Further, that it was not entirely soluble in water. The insoluble portion was collected on a tared filter, dried, and weighed 145 mg. of residue insoluble in water. On heating this residue with a mixture of 10 c.c. Sodium Carbonate test solution and 90 c.c. of Distilled Water there dissolved out 75 mg. and I obtained a brown solution much darker in color than the original standard test solution. On making this up to the same bulk and then standardizing against the standard in Nessler tubes this was found to be 1.5 times as strong as the original standard. There still remained on the filter a portion of dark brown scales of colored material that was not soluble in either water, alkali solutions, alcohol or ether. These experiments were repeated with but very slight difference amounting to only 5 mg. of residue insoluble in water and the resulting fluids were practically identical in color.

Stevens' Standard Caramel Testing Solution is subject to the criticism that it not only involves considerable time and routine on the part of the pharmacist, but still more, that it does not represent the entire caramel as the stronger portion of the caramel coloring, that requiring alkali for solution, is not taken up and his solution consequently represents only a part of the caramel.

Dr. George A. Menge (AMERICAN JOURNAL OF PHARMACY—

March, 1911—113) has criticized the Stevens' process for standard caramel test solution and has recommended in place thereof a test solution made as follows:

"Make a sulphuric acid solution by adding 2 c.c. of pure concentrated sulphuric acid (specific gravity 1.84) to 12 c.c. of water. Take 0.5 Gm. of sugar in a test tube—add 5 c.c. of the acid solution described above, and heat the mixture in a boiling water bath, with mixture continually submerged and with constant agitation, for exactly 5 minutes. Immediately add a little cold water and then 35 c.c. of the U.S.P. test-solution of potassium hydroxide; finally dilute to 100 c.c."

I have found this method to yield fairly uniform brown colored solutions but not entirely of the same tint as that obtained by the Stevens method. The Menge process is the color reaction of glucose with potassium hydroxide which is well-known under the name of Heller's or Mohr's Test when applied as a qualitative test in the examination of urine. The color is produced by glucose and not by caramel and it is entirely an arbitrary standard as applied to standardizing of caramel solutions.

F. A. Upsher Smith (American Journal of Pharmacy—September, 1911—411) recommends a process for standardizing caramel by comparison with an arbitrary standard consisting of a Nesslerized solution of ammonia, using a standard solution of ammonium oxalate to which 2 c.c. Nessler's solution is added as the arbitrary standard fixed for comparison. Here again we are comparing caramel with another coloring which is dissimilar.

From the writer's experiments he has become convinced that the preparations of caramel should be standardized against the caramel color itself and not against substitutes therefor as has been done in these proposed standard test solutions. This has led to the attempt to purify commercial caramel so as to isolate the coloring material and use this as a basis for a standard color solution to be used either as a coloring itself or to standardize commercial caramels. It was argued that if a purified caramel of fairly definite composition could be produced that standard solutions could then be made with but very slight variation that could be used for such purpose. Commercial caramels contain an uncertain quantity of unconverted sugar and probably traces of caramelan and experiments to produce a desiccated caramel by evaporation of a number of commercial samples yielded a hygroscopic material which could not be gotten into a sufficiently definite form to yield uniform results.

Experiments were then tried upon the precipitation of the caramel colorings by strong alcohol and as a result of a number of trials the following formula was evolved for a Purified Caramel:

PURIFIED CARAMEL.

Caramel	1000 gm.
Alcohol	3500 c.c.
Monohydrated Sodium Carbonate	4 gm.
Water	a sufficient quantity.

Weigh the Caramel in a capacious bottle or flask and add 250 c.c. of boiling water and thoroughly mix. Then gradually add 3000 c.c. of Alcohol shaking after each addition. Then set aside for six hours; decant the Alcohol on to a filter and wash the precipitated Caramel color with two portions of 250 c.c. each of Alcohol, decanting each time the Alcohol on to the filter. Drain the Alcohol thoroughly from the precipitate and dissolve it in 1500 c.c. of warm water. Add the Monohydrated Sodium Carbonate, filter the solution and evaporate it to the consistence of a thick syrup. Spread this upon sheets of glass or tin plates and when dry scrape off in scales the Purified Caramel and dry further in a desiccator over Sulphuric Acid for a day or until it ceases to lose weight.

In this process the alcohol dissolves out of the caramel, the unconverted sugar and the bitter and most of the odorous principles and only a small amount of the coloring. By distillation the alcohol can be recovered with but very little loss and used over again. The purified caramel so made is in dark brown, shining, translucent scales, free from bitterness and without any perceptible sweet taste and practically odorless. It is non-hygroscopic and dissolves readily and clearly in water and diluted alcohol. The yield averaged 37 per cent., and the purified caramel when compared in solution with the caramel from which it was made showed a tinctorial value of three times that of the latter. A sample of the purified caramel so made was exposed in an open vessel to the atmosphere during a rainy spell of two days when the air was charged with moisture, yet it remained in dry non-adhering scales which had absorbed but very little water and was readily dried by being placed for a short time in the desiccator. The addition of the small amount of sodium carbonate was found to be necessary as without it the purified caramel when once made and dried was not again entirely soluble in water. This is readily understood from the preliminary explanation regarding the composition of commercial caramels.

Tincture of Caramel.—I submit the following for Tincture of Caramel:

TINCTURE OF CARAMEL.

Purified Caramel	50 gm.
Ammonia Water	10 c.c.
Water	740 c.c.
Alcohol	250 c.c.

Mix the liquids and dissolve the Purified Caramel in the mixture; filter if necessary.

Tincture of Caramel so made appears to be permanent and can be used either as a coloring or to standardize caramel solutions. One c.c. tincture diluted with 99 c.c. distilled water or better still 199 c.c. distilled water will form a comparative solution against which commercial caramels can be readily standardized.

It is to be noted that the formula proposed by the Committee for Tincture of Caramel was 10 per cent. of the caramel prepared in accordance with the formula given. The formula now submitted contains but 5 per cent. of the purified caramel, but as this is three times the strength of the commercial caramel the tincture resulting from this formula is very materially stronger than the formula first submitted to the Committee. If 5 per cent. be considered too strong then it can be reduced to 2. per cent. or to such strength as may be agreed upon.

THE NAMING OF CARBON COMPOUNDS.

A Dictionary of the Prefixes, Suffixes and other Syllables as well as Letters and Signs Used in the Naming of Carbon Compounds.

By

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(Continued from page 119)

I

i An abbreviation of *inactive* (which see).

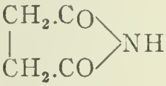
ic The suffix *ic* is applied to the name of organic compounds in the adjective sense with the general meaning "pertaining to" or "like," the nominative being indicated by the preceding syllables, thus *tartar-ic*.

Iota, the ninth letter of the Greek alphabet (see Appendix H).

id See *amid, olid, anilid,* etc.

ide The same as *id*.

imid Indicates compounds containing the group $(=NH)''$, thus



$$\left.\begin{array}{l} CH_2.CO \\ | \\ CH_2.CO \end{array}\right\rangle NH$$

is *butanimid.*

in See *ine.*

indo A prefix used to indicate relation to, or derivation from, indigo, thus *indole* is a basic compound derived from indigo. It is often used to refer to an indigo-like color, that is, blue, thus the *indolins* are a group of blue dye-stuffs.

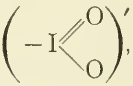
ine (a) The ending *in* or *ine* indicates the unsaturated group $(—C \equiv C—)''$, in which two carbon atoms appear to be trebly bound, thus $CH:CH$ is *ethine,* $CH_3.C:CH$ is *propine* (see Appendix C–b). (b) In naming the proximate principles of plants the ending *ine* is generally confined by American writers to basic compounds (alkaloids, etc.), thus *atropine, morphine, strychnine,* while the ending *in* is applied to certain active constituents of plants which are neutral or non-alkaloidal, thus *aloin, emodin,* etc. It is also used for *glycerides, glucosides,* bitter principles and proteids. (c) In many common names such as glycerin or glycerine, naphthalin or naphthaline the ending has no significance.

ino A suffix used in connection with names indicating the following groups, $(NH_2)'$, $(NHR)'$, $(NR_2)'$, $(NH)''$, $(NR)''$. Thus $NH_2CH_2.CH_2.COOH$ is called amin*o*propionic acid and not *amidopropionic acid.* See also *amido* and *amino.*

iod The prefix *iod,* often written *iodo* for the sake of euphony, is used to indicate the presence of iodine atoms (univalent iodine) in carbon compounds, thus iodo-benzene, C_6H_5I, is benzene in which one hydrogen atom has been replaced by iodine and *triiodomethane* is CHI_3.

iodo The prefix *iodo* is used to indicate the element iodine (see *iod*). The term is also used to indicate the group $—IO_2$ (see *iodoxy*).

iodoso The monovalent radical $(-I=O)'$, thus C_6H_5IO is *iodosobenzene.*

iodoxy The monovalent radical  $\left(-\mathrm{I}\begin{smallmatrix}=O\\ -O\end{smallmatrix}\right)'$, thus $C_6H_5IO_2$ is *iodoxybenzene.* See also *iodo.*

iso When a hydrocarbon contains a branched chain, that is, contains a carbon atom which is combined with more than two other carbon atoms, it is often distinguished from the isomeric *normal* (which see) hydrocarbon by the prefix *iso;* thus $CH_3.CH_2.CH_2.CH_2.CH_3$ is normal pentane and $CH_3.CH(CH_3)CH_2.CH_3$ is called *isopentane.*

isocyanate The monovalent radical $(.O.N:C)'$, thus *potassium isocyanate* is KONC.

isocyanide The monovalent radical $(.N:C)'$, thus *ethyl isocyanide* is $C_2H_5.NC$. See also *isonitrile.*

isonitrile Organic isocyanides (see *isocyanide*) are commonly called isonitriles, thus $(C_6H_5)NC$ is called *phenyl isonitrile.*

ium Just as the names of basic elements end in *ium,* thus *sodium, potassium, calcium,* and the basic group $(NH_4)'$ is called *ammonium,* so in the naming of organic compounds the ending, *ium,* denotes basic compounds. See *oxonium, sulphonium.* Similar carbon or *carbonium* compounds, iodin or *iodonium* compounds and even chlorin or *chloronium* compounds are known. It has been proposed to give this ending to the vegetable bases of alkaloids, thus *morphium sulphate, atropium hydrochloride,* etc.

K

κ Kappa, the tenth letter of the Greek alphabet (see Appendix H).

kacodyl The same as *cacodyl* (which see).

kata See Appendix J–e.

keto Indicates a *ketone* (which see), thus a ketohexose is a hexose containing a ketone group.

ketone Compounds containing the group $= C = O$ combined with two hydrocarbon radicals are called ketones, thus $CH_3.CO.CH_3$ is *dimethyl-ketone* (see *one*).

L

l An abbreviation for laevo (which see).

λ Lambda, the eleventh letter of the Greek alphabet (see Appendix H).

lact The syllable denotes derivation from milk; thus *lactose* is milk sugar, *lactic acid* is an acid obtained from milk, etc.

lactone A name applied to a class of compounds derived from alcohol acids by the elimination of water, thus $CH_2OH.CH_2.CH_2.COOH = H_2O + CH_2.CH_2.CH_2.CO$ (see *olid*).

lactyl The monovalent radical $CH_3.CHOH.CO'$ derived from lactic acid $CH_3.CHOH.COOH$. Thus *lactylphenetidin* is $C_6H_4.(OC_2H_5)(CH_3.CHOH).CO$.

laevo An abbreviation for *laevorotatory,* indicating that a substance deflects polarized light to the left.

M

m An abbreviation of *meta* (which see).

μ Mu, the twelfth letter of the Greek alphabet (see Appendix H).

malonyl The divalent radical $(.OC.CH_2.CO.)''$ derived from propanedioic or malonic acid, $COOH.CH_2.COOH$. Thus the hypnotic diethyl-barbituric acid is also called *malonyl urea* because it contains the malonyl radical in combination with urea.

Me Used in chemical formulas to represent the methyl group;

thus $CH_3.CH_2.CH(CH_3).CH_3$ is also written $CH_3.CH_2.CHMe.CH_3$.

menthyl The monovalent radical $(C_{10}H_{19})'$ derived from menthol $C_{10}H_{19}OH$. Thus *menthyl-isovalerate* is $CH_3.CH(CH_3).CH_2.CO.O.(C_{10}H_{19})'$.

mercaptan The same as *mercaptol* (which see).

mercaptol Synonymous with *thiol* (which see).

meso Meaning inactive or without effect on polarized light, thus *mesotartaric acid.*

meta The prefix *meta* or *m* is used to designate the 1 : 3 position in di-derivatives of benzene, thus 1, 3-dibrombenzene is also called *metadibrombenzene* (see Appendix B–).

meth The prefix denotes that a compound contains only one carbon atom, *methane* is CH_4, *methyl* is $(CH_3)'$, *methanol* is CH_3OH, etc.

metho Indicates the group $(CH_3)'$ if it be a branch of a side-chain (see Appendix A).

methoxy See *methoxyl.*

methoxyl The group $(—O—CH_3)'$, obtained by substituting methyl for the H in a hydroxyl group. It may also be considered as derived from methyl alcohol CH_3OH by elimination of the hydrogen of its hydroxyl.

methyl The monovalent radical $(CH_3)'$.

methylene The divalent radical $(CH_2)''$, this di-iodomethane; CH_2I_2 is also called *methylene iodide.*

mi The prefix has been proposed as a substitute for "meta," thus *miazine* for meta-azine (see *diazine*).

monatomic Alcohols and phenols containing one hydroxyl group are said to be *monatomic*, thus ethyl alcohol, C_2H_5OH, phenol C_6H_5OH, etc.

mono A prefix meaning one, thus C_2H_5Br is *mono-brom-ethane.*

N

n An abbreviation for *normal* (which see).

ν Nu, the thirteenth letter of the Greek alphabet (see Appendix H).

naphthyl The monovalent group $(C_{10}H_7)'$ derived from naphthalene $C_{10}H_8$, by elimination of a hydrogen atom or from naphthol, $C_{10}H_7OH$, by loss of the hydroxyl group.

nitrile The organic cyanides are preferably called nitriles, thus

CH_3CN is called *ethane nitrile,* or *acetonitrile* (see *acet* or *aceto*).

nitro A prefix indicating the group $(—NO_2)'$, derived from nitric acid by abstracting OH, thus *nitro-ethane,* $C_2H_5NO_2$, *nitrobenzene,* $C_6H_5NO_2$. Glycerine trinitrate, $C_3H_5(NO_3)_3$ is wrongly often called *nitroglycerine.*

nitroso Compounds containing groups with trivalent nitrogen are in general spoken of as *nitroso-compounds.* It is used in particular as a prefix to compounds containing the group $(C.N:O)'$, thus *nitrosobenzene* is C_6H_5NO.

nitrosyl The group $(.N:O)'$ used particularly when the group NO has replaced the hydrogen of a carboxyl group, thus *nitrosylbenzoate* is $C_6H_5COO(NO)$.

non The prefix non- and nono-, derived from *nonus,* is commonly used to indicate the numeral nine. Thus the hydrocarbon C_9H_{20} is called *nonane.* The hydrocarbon C_9H_{18} is called *nonene,* etc.

nono Signifying nine (see *non*).

nonyl The monovalent radical C_9H_{19} derived from nonane C_9H_{20}.

normal Aliphatic hydrocarbons in which no carbon atom is combined with more than two other carbon atoms are said to be normal, thus $CH_3.CH_2.CH_2.CH_2.CH_3$, is *normal pentane* (compare *iso*). The term "normal" is also applied to salts which are formed from acids and bases in such a way that no acidic hydrogen of the acid remains nor any of the basic hydroxyl of the base. Normal salts are not always neutral to indicators, thus *normal sodium carbonate* when dissolved in water yields a solution which is strongly alkaline towards litmus.

numbers See numerals.

numerals For the use of numerals in indicating the position of groups or side-chains see Appendix B.

O

o Abbreviation for *ortho* (which see).

ω Omega, the twenty-fourth (last) letter of the Greek alphabet (see Appendix H).

o Omicron, the fifteenth letter of the Greek alphabet (see Appendix H).

oct The prefixes *oct, octa, octi* and *octo* derived from *octus,* are commonly used to indicate the numeral eight. Thus the hydrocarbon C_8H_{18} is called *octane,* while an alcohol derived therefrom and containing eight hydroxyl radicals would be called *octaneoctol.*

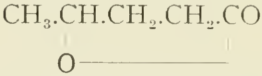
oi The prefix has been proposed as a substitute for *ortho*, thus *oizine* instead of ortho-azine (see *diazine*).

oic See Appendix G.

ol A suffix indicating hydroxyl, the (OH)′ group; thus CH_3OH is *methanol.* See Appendix D. The ending has also been applied to bodies which do not contain hydroxyl, thus *indol, skatol, pyrrol* and even *benzol, toluol, xylol* (see *ole*).

ole In the case of words which end in *ol* but do not contain a hydroxyl group it is proposed to change the ending to *ole*, particularly when they are basic in character (compare use of *ine* as an ending for basic compounds); thus *indole, skatole, pyrrole.*

olid The ending is given to anhydrides of alcohol-acids (alcohol anhydrides) or *lactones* (which see). Greek letters or numerals are used to indicate the relative position of the carboxyl group and the carbon atom combined with the alcoholic oxygen, thus $CH_3.CH.CH_2.CH_2.CO$ is *pentanolid* (1:4).



$$CH_3.\underset{|}{CH}.CH_2.CH_2.\underset{|}{CO}$$
$$O\text{——————}$$

one The syllable indicates the ketone group (R′.CO.R′, thus *propanone* or *acetone* is $CH_3.CO.CH_3$ (see Appendix F). Also compare *sulphone.*

one For significance of 1 see Appendix B.

ortho The prefix *ortho* or *o* is used to indicate the 1:2 position of derivatives of benzene compounds (see Appendix B–c). In the naming of inorganic acids the prefix "ortho" is given to that acid of a given series which contains the greatest possible number of hydroxyl groups, thus of the three acids derived from phosphorous pentoxide H_3PO_4 or $PO(OH)_3$ is called *orthophosphoric acid.* In accordance with this, compounds considered as derived from a hypothetical ortho-carbonic acid $C(OH)_4$ are called compounds of orthocarbonic acid; thus $C(OC_2H_5)_4$ is called *orthocarbonic acid ethyl ester* or *ethyl orthocarbonate.*

osazone Osazones are compounds formed by the condensation of two molecules of a hydrazine with a di-aldehyde, di-ketone or aldehyde-ketone or with a ketone-alcohol or an aldehyde-alcohol. In the case of aldehyde-alcohols or ketone-alcohols the alcohol group adjacent to the carbonyl group becomes oxidized to a carbonyl group before reacting with the hydrazine. From glucose and phenylhydrazine the *osazone* forms, thus: $CH_2.OH.CHOH.CHOH.CHOH.CHOH.CHO + C_6H_5NH.NH_2 = CH_2OH.CHOH.CHOH.CHOH.C(C_6H_5NH.N:)CH(C_6H_5NH.N:) + 2H_2O$.

ose The ending *ose* generally indicates a sugar, thus *lactose, glucose, fructose, sucrose,* etc. In such words as proteose, albumose, the ending "ose" is used to suggest relationship to parent bodies, *i.e.,* in the illustration given to albumin and protein.

oxalyl The divalent group $(.O:O.O:O.)''$ derived from oxalic acid, $(HO)OC.CO(OH)$.

oxime Compounds containing the group $(= N - OH)''$, thus $CH_3.C(N.OH)CH_3$ is *propanoxime (2)*, $CH_3.CH_2.CH:N.OH$ is *propanoxime* (1). When obtained from aldehydes, $CH_3.CHO + NH_2OH = CH_3.CH(:N.OH) + H_2O$, they are often called *aldoximes;* when from ketones $CH_3.CO.CH_3 + NH_2CH_3.C(N.OH)CH_3$ is *propanoxime* (2), $CH_3.CH_2.CH:N.OH$

oxonium Oxonium compounds are bodies containing tetravalent basic oxygen, showing some analogy to ammonium salts, whence the name.

oxy Indicates an oxide, thus ether (common or ethyl ether), $CH_3CH_2.OCH_2CH_3$, is *ethane-oxy-ethane.* Unfortunately, in the past "oxy" has commonly been used in place of *hydroxy* (which see); thus phenol is called *oxy-benzene,* resorcinol or phendiol is called *dioxybenzene,* etc. In general the term *oxy* is used to indicate oxygen content in radicals or compounds. Thus, while the radical $(C_2H_5)'$, considered as derived from ethan, C_2H_6, by loss of hydrogen or from ethanol, C_2H_5OH, by loss of hydroxyl, the radical $(C_2H_5O)'$ is called *ethoxy.* Again, while the radicals $(C_6H_5C)'''$ and $(C_6H_5CO)'$, derived from benzoic acid, C_6H_5COOH, are termed *benzo* and *benzoyl,* respectively, the radical $(C_6H_5COO)'$ is called *benzoxy* (which see).

oyl The ending *oyl* is given to radicals obtained by abstracting hydroxyl from the carboxyl group of organic acids, thus $CH_3.COOH = (OH)' + (CH_3.CO)'$, *ethanoyl;* $C_6H_5COOH = (OH)' + (C_6H_5CO)'$, *benzoyl.*

P

p An abbreviation for *para* (which see).

Phi, the twenty-first letter of the Greek alphabet (see Appendix H).

π Pi, the sixteenth letter of the Greek alphabet (see Appendix H).

ψ Psi, the twenty-third letter of the Greek alphabet (see Appendix H).

para The 1 : 4 position in benzene derivatives (see Appendix B–c); thus 1, 4-dichlorbenzene is also called *para-dichlorbenzene.*

pent *Pent, penta, pentyl,* prefixes derived from *penta,* meaning five, thus *pentane* is C_5H_{12}, *pentene* is C_5H_{10}, *pentyleoxide* is $C_5H_{10}O$.

penta See *pent.*

pentyl See *pent.*

per A prefix signifying the higher degree of valence in two similar compounds. See *peroxide.*

peri The 1 : 8 position in di-derivatives of naphthalene (see Appendix J–d).

peroxide A name assigned to any substance which yields hydrogen peroxide as one of the products of its decomposition. *Disuccinyl peroxide* is $COOH.CH_2.CH_2.CO.O.O.CO.CH_2.CH_2.COOH$.

Ph Used to indicate the phenyl group, C_6H_5, in formulas; thus $PhNH_2$ is aniline ($C_6H_5NH_2$).

phen The prefix is commonly used to indicate derivation from or relation to phenol, thus *phenol, phendiol, phentriol,* etc. It has been proposed to apply the name *phen* to benzene, C_6H_6, and to indicate all benzene derivatives by this prefix.

phenacyl The monovalent radical $C_6H_5.CO.CH_2$ — derived from aceto-phenone.

phenazine Phenazine is a name proposed for bi-cyclic compounds composed of an azine ring attached to a benzene ring.

phenetidin Amino-ethoxy-benzene, $C_6H_4(NH_2)(O.C_2H_5)$.

phenetol Phenol-ethyl-ether, benzene-oxy-ethane or ethoxy-benzene, $C_6H_5.O.C_2H_5$.

phenolsulphonate A salt derived from phenolsulphonic acid (see *sulpho*).

phenoxy The group $(C_6H_5O)'$. It may be considered as a *hydroxy* group, OH, in which a phenyl group, C_6H_5, has replaced the hyrogen.

phenyl The monovalent radical $(C_6H_5)'$ derived from phenol, C_6H_5OH.

phthal The syllable is used to indicate derivation from, or relation to, benzene-ortho-dicarboxylic acid, $C_6H_4(COOH)_2$ 1 : 2, which is commonly called *phthalic acid*. Thus *phenolphthalein* is a compound produced by the interaction of phenol and *phthalic anhydride*.

phthalyl A prefix denoting derivation from, or relation to, phthalic acid. Thus the alcohol, $C_6H_4(CH_2OH)_2$ 1 : 2, commonly called *phthalyl-alcohol*.

pi A prefix proposed as a substitute for *para*, thus *piazine* for para-azine (see *diazine*).

Pr In the writing of chemical formulas it has been proposed to indicate the propyl group $(C_3H_7)'$ by Pr, thus PrOH is *propyl-alcohol* $(CH_3.CH_2.CH_2.OH)$.

primary See Appendix D–b.

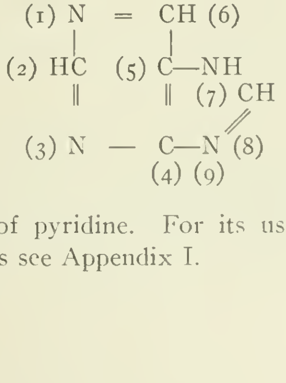
propyl The univalent radical $(C_3H_7)'$ derived from propane C_3H_8 by elimination of hydrogen or from propanol C_3H_7OH by abstraction of hydroxyl.

prop The prefix indicates C_3, thus *propane* is C_3H_8, *propene* is C_3H_6, etc.

pros See Appendix J–e.

pseudo The prefix derived from the Greek, ψευςὴς, meaning false, is applied in chemistry to compounds which similate or are closely related to others. Thus while isopropyl benzene is called cumene, its isomeric compound, trimethyl benzene, is called *pseudo-cumene*.

purin The purin nucleus is contained in such substances as caffeine, theobromine, xanthine, uric acid, etc. To indicate the position of groups, etc., the atoms of the purin nucleus are numbered thus:



Py An abbreviation of pyridine. For its use in the naming of quinoline derivatives see Appendix I.

pyro A prefix used to denote derivation from; often used to show that heat has been used in obtaining the substance, thus 1, 2-phendiol, is commonly called *pyrocatechin* because it was first obtained from catechu by dry distillation.

Q

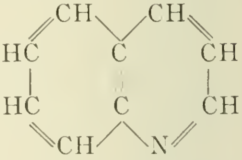
quart An abbreviation for *quarternary* (which see).

quarternary Four or fourth, thus quarternary amines are considered derived from ammonium hydroxide by replacement of all four hydrogen atoms, thus H_4NOH yields $(CH_3)_4NOH$.

quino A term used to indicate relation to, or derivation from (a) quinoline, (b) quinone and (c) quinine.

quinolin See *quinoline*.

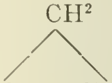
quinoline A basic compound having the formula C_9H_7N and to which the following structure is commonly assigned:



For the methods of indicating the position of side-chains see Appendix I.

quinqui A prefix indicating five.

R



r An abbreviation for "ring," thus cyclo-propane, $CH_2—CH_2$, is also called *r-propane*.

ρ Rho, the seventeenth letter of the Greek alphabet (see Appendix H).

S

s An abbreviation for *symmetrical* (which see).

σ, ς Sigma, the eighteenth letter of the Greek alphabet (see Appendix H). The second form (ς) is not used in chemical nomenclature.

santalyl The radical $(C_{15}H_{23})'$ derived from *santalol,* $C_{15}H_{23}OH$.

secondary See Appendix D–b.

six For the use of the number 6 see Appendix B.

succinyl The divalent group $(.OC.CH_2.CH_2.CO.)''$ derived from succinic acid, $COOH.CH_2.CH_2.COOH$.

sulf The same as *sulph* (which see).

sulph Indicating sulphur, thus *sulphone, sulphonic acid,* etc.

sulphamide Compounds derived from sulphonic acids by replacing OH by NH_2, thus the amide of benzene-sulphonic acid is also called *benzene sulphamide.*

sulphanilate A salt or compound of *sulphanilic acid,* $SO_2(C_6H_4\text{-}NH_2)(OH)$ derived from sulphuric acid, $SO_2(OH)_2$ by replacement of a hydroxyl group by an aniline group $(C_6H_4NH_2)'$.

sulphide The organic sulphides, also called *sulphur ethers,* are compounds derived from H_2S by replacement of hydrogen by organic radicals, thus *ethyl sulphide* is $(C_2H_5)_2S$.

sulphimide An *imide* (which see) derivative of a sulphonic acid, thus saccharine is the *imide* of *o-sulphobenzoic acid.*

sulphinide Sulphinic acids contain the group — SO_2H. An imide derived from sulphonic acids is sometimes called sulphinide, thus saccharine is official as *benzosulphinide.*

sulpho A term used to indicate the presence of sulphur in compounds in general (see *sulphocyanide, sulphocarbolate*). Also used to indicate sulphonic acid derivatives, thus benzensulphonic acid is also called sulphobenzoic acid and phenol-sulphonic acid derivatives are known also as *sulphocarbolates.*

sulphocarbolate Formerly used instead of *phenolsulphonate* (which see).

sulphocyanate The same as *thiocyanide* (which see).

sulphocyanide The same as *thiocyanide* (which see).

sulphone Sulphones are compounds containing the group $(SO_2)''$, thus *diethyl-sulphone* $(C_2H_5)_2SO_2$.

sulphonic acid Compounds containing the group $(SO_2.OH)'$ derived from sulphuric acid, $OH.SO_2.OH$, by abstraction of $(OH)'$, thus *phenolsulphonic acid* is $C_6H_4(OH)(SO_2.OH)$.

sulphonium Basic compounds of sulphur in which tetravalent sulphur is combined with three alkyl groups and one hydroxyl group, the latter reacting with acids to form salts, thus *triethyl-sulphonium-hydroxide* $(C_2H_5)_3S.OH$.

sym An abbreviation for *symmetrical* (which see).

symmetrical 1, 3, 5-tri-derivatives of benzene are said to be symmetrical; thus *1, 3, 5-trichlorbenzene* (see Appendix B–c).

syn A prefix referring to stereoisomerism, meaning *together,* as opposed to *anti* (which see). The prefix *syn* has also been proposed to indicate the *neighboring* or *vicinal* position in the arrangement of side-chains of the atoms in a heterocyclic compound, thus 1, 2-ortho- or oi-diazine are called *syndiazines.*

T

τ Tau, the nineteenth letter of the Greek alphabet (see Appendix H).

θ, ϑ Theta, the ninth letter of the Greek alphabet (see Appendix H).

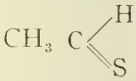
tautomer A name applied to bodies which may exist in two forms which are structurally different. In most cases tautomeric substances exist in ketone form ($R.CO.CH_2$) and "enol" form (unsaturated alcohol) ($R.C.(OH):CH.$).

terp The prefix usually denotes derivation from or relation to the hydrocarbon contained in turpentine (see Appendix K).

tetra *Tetra, tetryl,* prefixes derived from *tetra,* meaning four; thus *tetrachlorethane* is $C_2H_2Cl_4$, *tetrylinetriamine* is $C_4H_{11}N_3$.

tetryl See *tetra.*

thial Thio + al, sulphur aldehyde. Aldehydes in which the oxygen of the aldehyde group is replaced by sulphur, thus



$CH_3\,C\genfrac{}{}{0pt}{}{\diagup H}{\diagdown\!\!\diagdown S}$

is *ethane-thial.*

thio Denotes sulphur. See *thial, thiol,* etc.

thiocyanide The monovalent radical $(.S.C:N)'$, thus $C_2H_5.S.C:N$ is *ethyl thiocyanide.* Also called *sulphocyanide* and *sulphocyanate.*

thiol Thio + ol, a sulphur alcohol. Compounds in which the oxygen of the alcohol group is replaced by sulphur, thus *ethanethiol* is $CH_3.CH_2.SH$.

thione Thi(o) + one, a sulphur ketone. Ketone in which sulphur replaces the oxygen of the ketone group, thus $CH_3.CS.CH_3$ is *propane-thione.*

thionyl The divalent radical $(SO)''$. Thus *thionylaniline* is $C_6H_5.N:SO$.

three For use of the figure 3 see Appendix B.

toluol Toluol has in the past been used occasionally as a synonym for toluene.

toluyl The monovalent radical $(CH_3.C_6H_4)'$ derived from toluene (methyl-benzene) $C_6H_5.CH_3$.

tolyl Meaning the same as *toluyl* (which see).

tri A prefix meaning three; thus chloroform $CHCl_3$ is called *tri-chlor-methane.*

triatomic Alcohols and phenols containing three hydroxyl groups are said to be triatomic, thus pyrogallol (1, 2, 3-phentriol) is a *triatomic phenol.*

triazine An *azine* (which see) containing three nitrogen atoms, that is, consisting of three carbon atoms and three nitrogen atoms united in a "ring" by nine "bonds."

two For the significance of the figure 2 see Appendix B.

U

υ Upsilon, the twentieth letter of the Greek alphabet (see Appendix H).

V

v An abbreviation of *vicinal* (which see).

valeryl The monovalent radical $(C_4H_9CO)'$ derived from valeric acid C_4H_9COOH.

vicinal 1, 2, 3-tri-derivatives of benzene; thus 1, 2, 3-trichlorbenzene is also called *vicinal-tri-chlorbenzene* (see Appendix B–c).

vinyl A name sometimes applied to *ethenyl* (which see); thus $CH_2 : CHOH$, ethenol, also called *vinyl alcohol.*

X

ξ Zeta, the sixth letter of the Greek alphabet (see Appendix H).

xanthine For the naming of xanthine derivatives see *purin.*

xylol Sometimes used as a synonym for *xylene.*

xylyl A prefix used to designate derivation from xylene (dimethylbenzene), $CH_3.C_6H_4.CH_3$. It is particularly applied to the monovalent radical $CH_3.C_6H_4.CH_2'$; thus $CH_3.C_6H_4.CH_2Cl$ is called *xylyl-chloride.*

Y

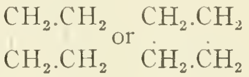
yl The ending *yl* is characteristic of many radicals, thus *methyl, ethyl, benzoyl,* etc. (which see).

ylal The ending *ylal* is used to indicate aldehyde radicals in which the aldehyde group is retained, thus *ethylal.*

ylol The ending *ylol* is given to alcohol radicals in which OH is retained, thus *ethylol.*

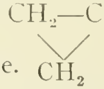
APPENDIX.

A. According to the rules adopted by a congress of chemists, held in Geneva, Switzerland, in 1902 (*American Chemical Journal,* vol. 15, p. 50. Berichte der deutschen chemischen Gesellschaft, vol. 26, p. 1595) the names of the saturated hydrocarbons, that is compounds of carbon and hydrogen in which the carbon atoms are united by single bonds or valencies only and which therefore contain no unsaturated valencies (double or treble bonds), end in "ane" (in the German language the final e in this, and in similar endings, is dropped and the ending is "an"). The first four hydrocarbons, CH_4, $CH_3.CH_3$, $CH_3.CH_2.CH_3$, $CH_3.CH_2.CH_2.CH_3$ are called methane, ethane, propane, butane; also $CH_2—CH_2$ is cyclo-propane and



$$\begin{matrix} CH_2.CH_2 \\ CH_2.CH_2 \end{matrix} \text{ or } \begin{matrix} CH_2.CH_2 \\ \vdots \quad \vdots \\ CH_2.CH_2 \end{matrix}$$

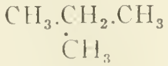
is cyclo-butane.



$$\begin{matrix} CH_2—CH_2 \\ \diagdown\ \diagup \\ CH_2 \end{matrix}$$

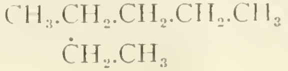
All other saturated hydrocarbons if normal, that is if no carbon atom is combined with more than two other carbon atoms, are named by indicating the number of carbon atoms by a prefix derived from the Greek numerals and adding the suffix "ane," thus C_5H_{12}, C_6H_{14}, C_7H_{16}, C_4H_{48}, C_9H_{20}, $C_{20}H_{22}$ are called pentane, hexane, heptane, octane, nonane, decane respectively.

The hydrocarbons which are not normal but contain a carbon atom combined with more than two other carbon atoms, *i.e.*, are branched chains, derive their names from the longest normal chain contained in them and the side-chains are indicated by prefixes, ending in "yl," thus:



$$\begin{matrix} CH_3.CH_2.CH_3 \\ \dot{C}H_3 \end{matrix}$$

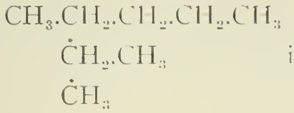
is methyl-propane



$$\begin{matrix} CH_3.CH_2.CH_2.CH_2.CH_3 \\ \dot{C}H_2.CH_3 \end{matrix}$$

is ethyl-pentane

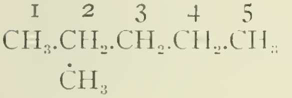
If the side-chain also is branched, the branches are given these endings "o" instead of "yl," thus:



$$\begin{array}{l} CH_3.CH_2.CH_2.CH_2.CH_3 \\ \qquad \dot{C}H_2.CH_3 \\ \qquad \dot{C}H_3 \end{array}$$

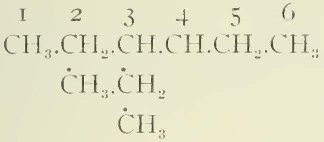
is metho-ethyl-pentane.

B. (a) To indicate the point of attachment of side-chains the carbon atoms of the main chain are numbered beginning at the end nearest the side-chain and the number of the carbon atom to which the side-chain is attached added to the side chain. If there are two side-chains equally distant from the ends then the numbering is begun at the end nearest the smaller side-chain, thus:



$$\begin{array}{l} \;1 \qquad\; 2 \qquad\; 3 \qquad\; 4 \qquad\; 5 \\ CH_3.CH_2.CH_2.CH_2.CH_3 \\ \quad \dot{C}H_3 \end{array}$$

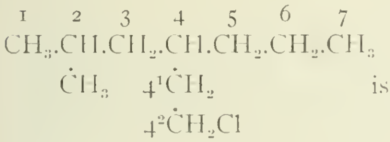
is *2*-methyl-pentane or methyl(*2*)-pentane.



$$\begin{array}{l} \;1 \qquad\; 2 \qquad\; 3 \qquad\; 4 \qquad\; 5 \qquad\; 6 \\ CH_3.CH_2.CH.CH.CH_2.CH_3 \\ \qquad \dot{C}H_3.\dot{C}H_2 \\ \qquad\qquad \dot{C}H_3 \end{array}$$

is 2-methyl-3-ethyl-hexane
or methyl(2)-ethyl(3)-hexane
or methyl-ethyl-hexane (2:3).

If it becomes necessary to number the carbon atoms of a side-chain then the numbers begin at the point of attachment and these numbers are added as indices to the number of the carbon atom of the main chain, thus:

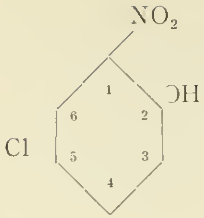


$$\begin{array}{l} \;1 \qquad 2 \qquad 3 \qquad 4 \qquad 5 \qquad 6 \qquad 7 \\ CH_3.CH.CH_2.CH.CH_2.CH_2.CH_3 \\ \quad \dot{C}H_3 \quad 4^1\dot{C}H_2 \\ \qquad\qquad 4^2\dot{C}H_2Cl \end{array}$$

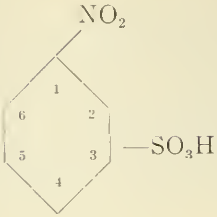
is 2-methyl-4^2chloro-4-ethyl-heptane.

(b) The carbon atoms of the benzene ring are numbered 1 to 6 from left to right. In poly-substitution compounds of benzene the numbering begins at the carbon atom attached to the element having the smallest relative weight, or in case of two or more like atoms, to the group having the smallest relative weight, thus:

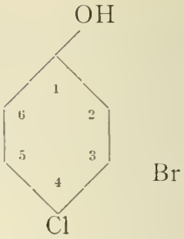
1.



2.



3.



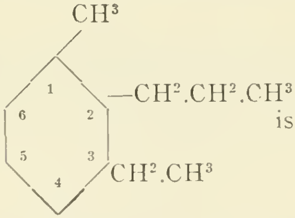
The names are then derived by giving the groups in the order of the increasing atomic weights of the atoms which link the group to the neucleus, and the above benzene compounds are called:

1. 1-nitro-2-hydroxy-5-chlorbenzene or nitro-hydroxy-chlorbenzene (1:2:5).

2. 1-nitro-3-sulphonic-acid-benzene or nitro-sulphonic-acid-benzene (1:3).

3. 1-hydroxy-4-chlor-3-brombenzene or hydroxy-chlor-brombenzene (1:4:3).

When two or more groups are attached to the benzene ring by like elements then the numbering begins at the carbon atom bearing the group which has the smallest weight and they are named in the order of their increasing weights, thus:



is 1-methyl-3-ethyl-2-propyl-benzene.

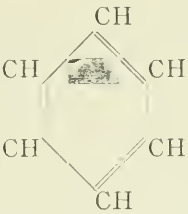
Many authors, thus Richter (Lexicon of Carbon Compounds) have not adopted the use of numbers to indicate the position of side-chains or radicals in open-chain compounds, but use them only for benzene derivatives and, for the open-chain compounds employ Greek letters, instead. Compare H, I, J and K (this Appendix).

(c) Instead of indicating the position of side-chain or substituents of benzene by numbering the carbon atoms and indicating by these numbers the carbon atoms to which each group is attached, other designations are in use, thus:

1, 2-dichlorbenzene is also called ortho-dichlorbenzene,
1, 3-dichlorbenzene is also called meta-dichlorbenzene,
1, 4-dichlorbenzene is also called para-dichlorbenzene,
1, 2, 3-trichlorbenzene is also called vicinal trichlorbenzene,
1, 3, 5-trichlorbenzene is also called symmetrical-trichlorbenzene,
1, 2, 4-trichlorbenzene is also called asymmetric-trichlorbenzene.

(d) A number, if in brackets, refers to the preceding element or group, otherwise to the element or group immediately following, thus 1-brombutene(*2*) is $CH_3CH : CH.CH_2Br$.

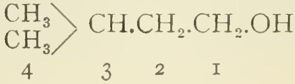
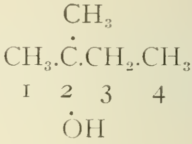
C. (a) According to the rules of the Geneva Congress open-chain unsaturated hydrocarbons containing a double bond are named by changing the ending "ane" of the corresponding saturated hydrocarbon to "ene." When two, three, etc., double bonds occur in such a compound then the ending becomes "diene," "triene," etc. The position of the double bond is indicated by the number of the first carbon atom participating in this double linkage, thus $CH_2 : CH_2$ is called ethene and $CH_2 : CH.CH_2.CH_2.CH : CH_2$ is called
6 5 4 3 2 1
hexa-1,5-diene. While the naming of cyclic compounds was not considered at this conference, it would naturally follow that benzene,

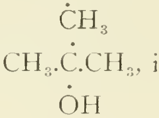


be called cyclo-hexatriene.

(b) According to the rules of the Geneva Congress, hydrocarbons containing a triple bond end in "ine" thus acetylene, $CH : CH$, should be called ethine and $CH : C.CH_2.CH_3.C : CH$ hexa-1, 5-diine.
6 5 4 3 2 1

D. (a) In accordance with the rules of the Geneva Congress the names of alcohols (and phenols) are derived by adding the suffix "ol" to the names of the hydrocarbons from which they are derived.

An alcohol containing two hydroxyl groups is a "diol," one containing three is a "triol," etc. Accordingly wood alcohol CH_3OH, is methanol, ordinary alcohol, $CH_3.CH_2OH$ is ethanol, glycerol (glycerin), $CH_2OH.CHOH.CH_2OH$ is propanetriol, the chief constituent of fusel oil  $\underset{4}{\begin{matrix}CH_3\\CH_3\end{matrix}\rangle}\ \underset{3}{CH}.\underset{2}{CH_2}.\underset{1}{CH_2}.OH$, is 3-methyl-butane-1-ol and the hypnotic known as amylene hydrate,  $\underset{1}{CH_3}.\overset{CH_3}{\underset{OH}{\underset{2}{C}}}.\underset{3}{CH_2}.\underset{4}{CH_3}$ is 2-methyl-butane-2-ol.

(b) All alcohols may be considered as having been derived from methyl alcohol, CH_3OH, by replacement of one, two or three hydrogen atoms by hydrocarbon groups. According to the hydrogen atoms so replaced they contain the groups $—CH_2OH$, $= CHOH$ or $\equiv COH$. They are called primary, secondary and tertiary alcohols, thus butanol(1), $CH_3.CH_2.CH_2.CH_2OH$, is primary butyl alcohol: butanol(2), $CH_3.CH_2.CHOH.CH_3$, is secondary alcohol and methyl-(2)propanol(2),  $CH_3.\overset{CH_3}{\underset{OH}{C}}.CH_3$, is tertiary butyl alcohol.

(c) Sometimes the names of alcohols are derived by considering them derived from methyl alcohol, also called carbinol, thus butanol-(2), $CH_3.CH_2.CHOH.CH_3$ is called methyl-ethyl-carbinol and methyl(2)-propanol(2), $CH_3.C(CH_3)(OH).CH_3$, is called trimethyl-carbinol.

E. According to the rules of the Geneva Conference the names of aldehydes are formed by adding "al" to the corresponding hydrocarbon, thus formaldehyde, $HCHO$, is methanal and acetaldehyde, $CH_3.CHO$, is called ethanal.

F. For ketones the Geneva Congress adopted the ending "one," thus acetone, $CH_3.CO.CH_3$, is propanone and acetyl-acetone, $CH_3.CO.CH_2.CO.CH_3$, is pentane-dione (2:4). Similarly the ending in menthone, carvone, irone, ionone shows that these bodies are ketones.

G. According to the rules of the Geneva Conference the aliphatic, or fatty, acids are named by adding "-oic acid" to the name of the hydrocarbon from which they are derived. In indicating the position of side-chains the carbon atom of the carboxyl group is given the number 1, thus formic acid, $HCOOH$, is methanoic acid, acetic acid, CH_3COOH, is ethanoic acid, valeric acid, $CH_3.CH(CH_3).CH_2.COOH$, is 3-methyl-butanoic acid(1), lactic acid, $CH_3.CHOH.COOH$, is 2-hydroxy-propanoic acid or propan-2-olic acid. Since the carboxyl group in the last compound can be at the end carbon atom only, its position need not be indicated.

H. (a) While according to the rules of the Geneva Congress the position of side-chains or groups is indicated by numbering the carbon atoms of the main chain (see B in this Appendix) many chemists use numerals for cyclic compounds only and employ the letters of the Greek alphabet (see d below) for chain compounds; thus $\underset{\alpha}{CH_3}.\underset{\beta}{CH}(CH_3).\underset{\nu}{CH_2}.\underset{\varsigma}{CH_2}.\underset{\varepsilon}{CH_3}$ is β-methyl-pentane.

(b) The custom of indicating the position of radicals in hydroxyl-acids, amino-acids, etc., by lettering the carbon atoms, beginning at the carbon atom adjacent to the carboxyl group is somewhat confusing; thus $\underset{\beta}{CH_3}.\underset{\alpha}{CHOH}.COOH$ is then called α-hydroxypropanoic acid and $\underset{\beta}{CH_2OH}.\underset{\alpha}{CH_2}.COOH$ is β-hydroxypropanoic acid. The carbon atom at the end of a chain is often indicated by ω

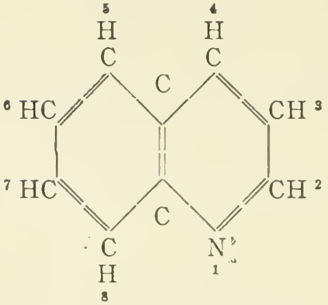
(c) The sign or lette Δ is also much used to denote double bonds, thus Δ_4-pentenoic acid denotes that in the 5-carbon ("pent") acid (oic acid) the double bond (ene) proceeds from the fourth carbon atom, thus $\underset{5}{CH_2}:\underset{4}{CH}.\underset{3}{CH_2}.\underset{2}{CH_2}.\underset{1}{COOH}$. Here it again is confusing that some authors begin the numbering, or lettering, at the end carbon atom while others give to the carbon atom adjacent to the carboxyl group the figure 1 or the letter α.

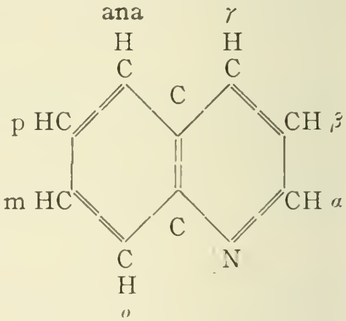
For the manner of indicating the position of side-chains in quinoline derivatives see in this Appendix I; for napthalene derivatives see in this Appendix J; for terpenes see in this Appendix K.

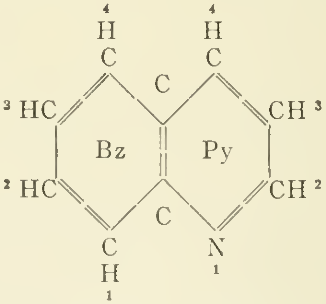
GREEK ALPHABET.

α = Alpha
β = Beta
γ = Gamma
Δ, δ = Delta
ε = Epsilon
ζ = Zeta
η = Eta
θ, ϑ = Theta
ι = Iota
κ = Kappa
λ = Lambda
μ = Mu
ν = Nu
ξ = Xi
ο = Omicron
π = Pi
ρ = Rho
σ, ς = Sigma
τ = Tau
υ = Upsilon
φ = Phi
χ = Chi
ψ = Psi
ω = Omega

I. Three different methods of indicating the position of groups or side-chains in quinoline derivatives are in vogue. In reduced quinoline nuclei, a displacable hydrogen is also connected with the nitrogen atom, for which the position one (1) is reserved.





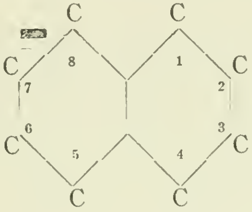


(a) Beginning at the nitrogen atom, the eight reactive atoms are numbered consecutively from left to right, and 8-hydroxyquinoline, the sulphate of which is known as chinosol, means that the OH has replaced the H at the carbon atom bearing the number 8.

(b) The carbon atoms of the pyridine portion of the molecule are lettered α, β, γ, etc., as indicated above, while the carbon atoms of the benzene portion of the molecule are designated o-, m-, p- and an (ana), as indicated above, and 8-hydroxyquinoline then becomes o-hydroxyquinoline.

(c) The pyridine part of the molecule is also indicated by Py- and beginning at the N atom, the atoms are numbered 1, 2, 3, 4, while the benzene portion of the molecule is indicated by Bz- and the carbon atoms are again numbered 1, 2, 3, 4 as indicated above. Then 8-hydroxyquinoline is designated as Bz-1-hydroxyquinoline.

J. (a) To indicate the point of attachment of substituents in naphthalene its carbon atoms are numbered thus:



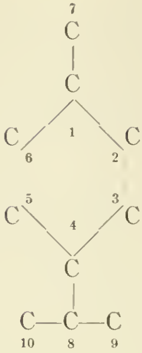
(b) The carbon atoms numbered 1, 4, 5, 8 are also designated "alpha" or "α" and those numbered 2, 3, 6, 7 as "beta" or "β," thus alpha-naphthol or α-naphthol and beta-naphthol or β-naphthol.

(c) Occasionally the terms "ortho," "meta" and "para" (see B, c in this Appendix) are used in naming bi-derivatives just as they are used in the naming of benzene derivatives.

(d) The prefix "peri-" is used to indicate the 1; 8-position in bi-derivatives of naphthalene, thus, 1, 8-naphthol-sulphonic acid, $C_{10}H_6(OH)(HSO_3)$, is also called peri-naphthol-sulphonic acid.

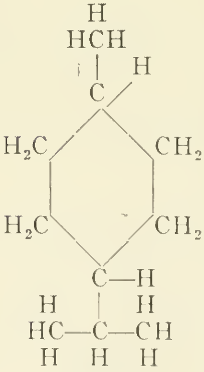
(e) Naphthalene derivatives having the 1, 5-position are called *ana*-derivatives, those in the 1, 6-position *epi*-, in the 1, 7-position *kata*-, in the 2, 6-position *amphi*-, and in the 2, 7-position *pros*-derivatives.

K. (a) Many of the terpenes, $C_{10}H_{16}$, are closely related to methyl-isopropyl-benzene: to indicate the position of substituents the following scheme of numbering the carbon atoms is used:

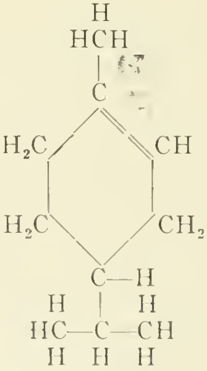


(b) The position of double unions is indicated by the sign “Δ” (see H, c in this Appendix); thus, if the double bonds are between 1 : 2 and 4 : 5 thus is indicated by Δ 1,4; if between 1 : 2 and 4 : 8 it is written Δ1,4(8).

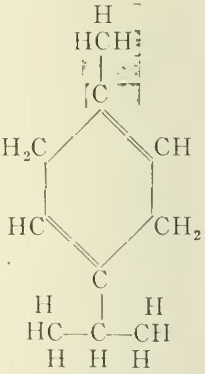
(c) It has been proposed that in the naming of these terpenes they be considered as derived from hexahydro-cymene, $C_6H_{10}(CH_3)$-(C_3H_7), and to call this substance terpane, the ending “ane” denoting that it contains no double or unsaturated unions. Then tetrahydro-cymene, containing one double bond, becomes terpene and dihydro-cymene is terpa-di-ene, thus:



Terpane.



Terpene.



Terpadiene.

Menthol, which is a monatomic alcohol of terpane, $C_6H_9(CH_3)$-(OH) (C_3H_7), 1 : 3 : 4 is then called *terpanol*. Terpin hydrate, which is a diatomic alcohol of terpane, containing one molecule of water of crystallization, is then called *terpanediol hydrate*.

LABORATORY OF THE AMERICAN MEDICAL ASSOCIATION.

THE FEBRUARY PHARMACEUTICAL MEETING.

The February Pharmaceutical meeting was held on Friday at 3 P. M. in the Materia Medica Lecture Room, Mr. William McIntyre in the chair. Dr. Adolph W. Miller spoke very entertainingly on "The Mythology of Trees." He said there are many interesting legends concerning trees. Men just emerging from barbarism usually venerate natural objects. During the warm pleasant days of summer, when food was plentiful, men basked in the sunshine and enjoyed themselves, but the cold dark days of winter brought great distress, this led men to worship the sun and fire as gods. Three classes of objects became to uncivilized men objects of worship; these were mountains, trees, and rivers. Primitive man as he walked the earth kept his eyes upon the ground in search of objects of food, as he elevated his eyes he beheld the high tree tops, or still higher mountains, or the broad rivers, so that these all became to him sacred, and this sanctity extended to parts of these objects, such as wood from the trees or stones from the mountains. A portion of the twin oak of Jupiter was said to have been given to Jason, leader of the Argonautic expedition, which he had built into the prow of his vessel. Our forefathers of Briton and Germany believed not only in the sanctity of the oak, but also of the ground underneath. They did not believe in temples built with men's hands. In the black pine forests of Northern Europe the silence was ordinarily most impressive, but at times was broken by the storm announcing the coming of the old Norse god, "Wodan." The oak was sacred to the nations of Northern Europe. Underneath its shade they held their religious and judicial meetings, but the oak was specially sacred when the mistletoe was found growing upon it. There is a legend of Baldur, son of Odin (Wodan), a sun god from whom a beautiful and bright light is said to have emanated, being killed by a sharpened twig of mistletoe thrown at random by the blind god Hodur. In modern times the mistletoe is regarded as a bearer of good tidings, especially at Christmas time when hung over head. It is said, however, to bring misfortune when cast under foot. A decoction of the mistletoe is used by some as a medicine. In the days of the Druids when the mistletoe was found growing upon an oak, it was cut by one of the priests with a golden knife, admist religious ceremonies.

Ancient nations believed that man originated from trees. There is a legend in the East that man and woman sprang from oak and elm logs that were found floating in the Persian Gulf. Some of the illustrious families of Greece derive their origin from trees. The ash tree was the tree of life to the ancient Germans. They also believed in the sacred apple tree, from which Juno was said to have given of the fruit of the tree to old men who were thus rejuvenated. The ancient Brahmans had also a sacred tree under which Buddha was said to have obtained sanctity and to have been tempted forty-nine days. It is called the *Ficus religiosum.* Pilgrimages are made to the sacred banyan tree in the Island of Ceylon. The sandal wood tree is greatly revered by the three great religions of the East. Frequently when a man of prominence dies, each of his friends sends a stick of sandal wood for building a funeral pyre upon which the body of the departed is cremated. The quality of the sandal wood is indicated by its color, the dark heart wood yielding the volatile oil. Beautiful carved work boxes are frequently made from sandal wood, the odor protecting the contents from destruction by the white ants. The olive tree in the East, especially among the Jews, is considered a symbol of peace. Dr. Miller also spoke of the Christian missionaries sent out from Rome who cut down the oak groves of the Druids, often amidst the curses of the people. At one time an oak broke in falling, and fell in the shape of the cross. This supposed miracle was the means of converting many to Christianity. Trees are still worshiped to some extent in Germany. At certain times of the year troops of the young people go out to the woods, half Christian and half heathen ceremonies being carried out. At the close of Dr. Miller's address, Dr. C. B. Lowe spoke of the invasion a number of years ago, of the apple orchards of Brittany France, by the mistletoe. The appearance of this parasite caused consternation among the peasants, as it threatened to greatly lessen their apple crop. It proved, however, to be a blessing in disguise, as the mistletoe which they gathered and shipped to England yielded a larger return than their apples had done. He also alluded to the gates, 11 feet high and 9 feet wide, of sandal wood, richly carved, which were once part of the temple of Somnath in Guzerat, once esteemed the holiest temple in India. They were captured and carried off to Afghanistan in 1025, where they remained until recaptured by the English in 1842, when they were taken back to India. They are now preserved in the citadel of Agra.

A paper by Mr. John K. Thum, Ph.G., apothecary at the German Hospital, was then read. The title of the paper was "Note on Proposed Formula for Petrox." He seemed to prove conclusively that the proposed formula was not an improvement over that of the N. F. (See March issue AMERICAN JOURNAL OF PHARMACY.) Prof. Charles H. LaWall then spoke in an interesting manner of some of the imported drugs that had been sent to him for examination as a government chemist. He said that the government had had much trouble with Italian preparations on account of their extravagant claims and misstatements. One that had passed through his hands was Compound Syrup of Horseradish with Ferrous Iodide and Cinchona. The Italians are great users of effervescent granular salts, but they do not put exact labels on these preparations, simply labeling them as granular effervescent salts without specifying their exact composition, so that they can not be held for deficiency in strength. Some curious Chinese drugs were shown, some pills being the size of shellbarks, coated on the outside with a thick coating of wax, containing inside another pill coated with gold foil, each pill weighing half an ounce. Prof. LaWall stated that owing to the rigid inspection by the government authorities, there had been a great improvement in the quality of drugs, asafetida never yielding less than 40 per cent, of resin and sometimes 70 per cent. An importation of what was called cinchona sweepings, was found to contain 30 per cent. mineral matter and only yielded one per cent. of cinchona alkaloids. Cocabutong was found to be absinthe fortified with coca. A preparation brought to him by a gardener for analysis was found to be a 40 per cent. solution of nicotine in a fixed alkali. During the analysis he incinerated a weighed quantity to ascertain the ash. During the process he was so saturated with nicotine as to be unable to smoke a cigar for a week. Each time he tried it made him sick, like a beginner. After a vote of thanks to those who had furnished papers for the meeting, adjournment took place.

C. B. LOWE.

NOTES AND NEWS.

Professor Joseph P. Remington, Dean of the Philadelphia College of Pharmacy, was tendered a dinner in commemoration of the sixty-fifth anniversary of his birth, by the members of the Philadelphia Drug Club, on Tuesday evening, March 26th. In addition to the members of the Drug Club there were also present the members of the faculty and officers of the Philadelphia College of Pharmacy and a number of the out-of-town friends of Professor Remington. Mr. George D. Feidt, President of the Drug Club, acted as Toastmaster and presented Professor Remington with a large bouquet of "American Beauty Roses." Mr. Joseph L. Lemberger made the principal address upon "Our Honored Guest." This was followed by a response by Professor Remington, who in a very happy address thanked the members of the Drug Club for this expression of their esteem and for their loyal support in all of his labors.

Numerous letters and telegrams were received from his friends in various parts of the United States, Cuba, and abroad, expressing their felicitations on the occasion, and some of these were read at the dinner. Various addresses were made, among which the following may be mentioned: President Howard B. French responded on behalf of the Philadelphia College of Pharmacy; Dr. S. Solis Cohen for the Medical Profession; Dr. Adolph W. Miller on behalf of the Wholesale Druggists; Mr. D. J. Reese for the Retail Druggists; Dr. John F. Hancock on behalf of the American Pharmaceutical Association; Professor Charles H. LaWall on behalf of the Pennsylvania Pharmaceutical Association; Mr. Milton C. Campbell for the Pharmaceutical and Chemical Manufacturers. Other addresses were made by Mr. D. E. Bransome; Mr. F. W. Fluck; Mr. Frank W. Smith; Mr. George W. Fehr; Mr. Otto Krause; Mr. W. L. Cliffe; Prof. Henry Kraemer; Mr. John N. G. Long; Mr. Harry P. Cassidy; Mr. Penrose Jones and Prof. H. C. Wood, Jr.

THE AMERICAN
JOURNAL OF PHARMACY

MAY, 1912

A PROBLEM IN THE ASSAY OF FLUIDEXTRACT OF GELSEMIUM.

(Employing the LaWall Process.)

With Some General Remarks.

By L. E. Sayre.

Applying the LaWall alkaloidal assay process to the assay of Fluidextract of Gelsemium, the chief difficulty encountered in its successful application is found to be connected with the persistent presence of the fluorescent principle—the so-called Gelsemic Acid. The presence of very minute quantities of this seriously interferes with the sharpness of the change of color at the end point—point of neutrality—when the final solution of mixed alkaloids is titrated, using cochineal as indicator.

The LaWall Process,[1] briefly stated, is as follows:

> Dissolve 25 Gm. of Sodium Chloride in a graduated, 100 Cc. stoppered cylinder, in water enough to make 85 Cc. Add 10 Cc. of the fluidextract to be assayed and then make up the volume to 100 Cc. Agitate well for about one minute. Let stand for five minutes, agitate again and pour on a dry filter.
>
> Collect 50 Cc. of the filtrate representing 5 Cc. of the fluidextract and shake out with the proper amounts of the appropriate solvents, as directed for the final extraction of the alkaloid. Finally, titrate the solution of the mixed alkaloids, (in N/50 acid) with N/50 KOH. For computation of strength, the factor 0.1630 for 5 Cc. of Fluidextract is employed.

After several unsuccessful attempts to remove traces of this fluorescent principle (Gelsemic Acid) without, at the same time, removing the alkaloid, we have succeeded in accomplishing this by the following simple method. The final solution of the alkaloids in chloroform is shaken with two portions (12 c.c. each) of distilled water. This water carries with it some alkaloid which is again washed out *at once* with chloroform. *At once* because, if the aqueous solution stands any length of time, the alkaloid seems to be lost by hydration (?). It takes but a few hours to lose entirely this minute quantity of alkaloid in aqueous solution. It is worthy of notice that some of the alkaloids of Gelsemium are appreciably soluble in water.

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[1] See *Jour. Amer Pharm. Ass'n,* Jan., 1912, p. 29.

DIFFICULTIES IN APPLYING THE LAWALL PROCESS: For general assay purposes, that is, for the purpose of assaying various fluidextracts of Gelsemium of the market, we find considerable difficulty in applying the LaWall process. The fluidextracts of the market vary considerably in physical properties. This may be due to several causes; first, they are not all made by the official process evidently, but even if so made, they would vary from uncontrollable causes. For example, age of the preparation, age of the drug from which the preparation was made, the period of the year at which the drug was collected, and the locality from which the drug was gathered. Furthermore, we may say in passing that our examination of fluidextracts of Gelsemium, leads us to think that some of the manufacturers have attempted to secure uniformity of color by the addition of caramel, thus darkening a fluidextract of a light color. As a matter of fact, we have found some of the dark colored fluidextracts to be weaker in total alkaloids than the light.[2] If such a practice is indulged in, we certainly do not believe it a wise one.

Taking into consideration the variable physical quality of the fluidextracts of Gelsemium, we would naturally discard a method which would have a comparatively narrow range of application. This narrow range we find to be characteristic of the LaWall process when applied to Gelsemium preparations. A drug laboratory method should be one suited to the greatest variety of preparations found in the market—such as result from the above variable conditions.

The LaWall process applied to the fluidextract of Gelsemium which contains a very small percentage of coloring and inert matter works admirably, but we find that the time limit for the precipitation of the inert matter is entirely too short. The solution of the fluidextract in salt solution should remain about twelve hours and then we find complete precipitation, but this precipitation carries down with it an appreciable amount of alkaloid. Therefore, for such fluidextracts as contain small amounts of coloring and inert matter, using the LaWall process, we would precipitate 10 c.c. of the fluidextract with about 75 c.c. (instead of 100 c.c.) of salt solution. After the precipitate has separated properly, it is filtered and the precipitate on the filter is washed with a sufficient quantity of 2 per cent. sulphuric acid to make 100 c.c. The combined filtrates are then neutralized, washed with immiscible solvents and finished as prescribed by the LaWall process to completion.

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[2] Many of the very light fluidextracts are evidently made from the fresh or green root.

For those fluidextracts of Gelsemium on the market that are loaded with highly colored extractive matter, when these are treated by salt solution, there seems to be, in many cases, a colloidal precipitate which passes through the filter and the collectible precipitate clogs the filter. The LaWall process in these fluidextracts therefore fails. If, however, we substitute for a salt solution, acidulated water (2 per cent. sulphuric acid) we obtain a perfect precipitate inside of thirty minutes, when we then secure a very nice clear filtrate. If, therefore, we substitute the salt solution by acidulated water, we obtain a filtrate which, when followed by the other details of the LaWall process, gives us perfectly satisfactory and uniform results, bearing in mind, of course, the precaution which is emphasized in the beginning of this article, namely, to wash the chloroformic solution of alkaloids with two portions of 12 c.c. each of distilled water before titration.

IMPORTANCE OF STANDARDIZATION OF FLUIDEXTRACTS OF GELSEMIUM: It is the opinion of the writer that the Pharmacopœia should by all means, in its next issue, furnish not only a standard but a process for the assay of the Fluidextract of Gelsemium. Our experience in examining the fluidextracts on the market is that they are exceedingly variable in therapeutic quality; the alkaloidal variation being from about .02 per cent. to .5 per cent. of total alkaloids. It is the opinion also of the writer that a fair standard would be that the preparation should contain at least .225 per cent. of total alkaloid when assayed by the above process.

THE RELATIVE VALUE OF PHYSIOLOGICAL AND CHEMICAL ASSAY OF GELSEMIUM: We have performed in the Laboratory about one hundred different assays of Fluidextracts of Gelsemium and have also had an opportunity of observing the value of a physiological standardization. While we are not prepared to make any positive statements at present with regard to the relative value of a chemical and a physiological assay, we feel safe in saying that a chemical assay alone for this drug is quite as valuable as a physiological assay alone; that a physiological assay and a chemical assay together gives one a better idea of the therapeutical value of the drug. But we are inclined to think that these two combined do not fully satisfy the practical requirements of the clinician who must get his standard from his own clinical practice. We would say further, that this remark applies to the standardization of almost any drug.

Mr. C. E. Vanderkleed[3] has stated that the manufacturer desires to put his products on the market of definite physiological strength—this is quite proper, but it must be borne in mind that there are so many factors to be taken into consideration that are not considered in a pharmacopœial or a physiological test, that these can scarcely be considered clinically satisfactory. However, a chemical test for the practical purpose of administering the Food and Drugs Law should reveal a percentage of total alkaloids in Gelsemium of at least .225 per cent. to be official.

A word must be said concerning the chemical test which confesses its weakness from a physiological point of view. The drug contains at least three different alkaloids. Until we can prove by pharmacological experiment which one of these alkaloids is the chief medicinal agent, the chemical assay, which reveals the total alkaloid, will give data, the value of which will be subject to criticism. One of the most prominent pharmaceutical manufacturers states the proposition thus:

> "Until you elucidate the chemistry of Gelsemium we will not be able to adopt a more definite standard than the assay of combined alkaloids—we do not know what alkaloids are present nor in what relative proportions."

I am indebted to Mr. R. K. Dillingham, assistant, for valuable aid in making the above alkaloidal determinations.

COLOCYNTH U. S. P.*

By J. R. Rippetoe, P.D., and R. Minor, Phar.D.

The U. S. P. 8th revision defines Colocynth as the "peeled dried fruit of *Citrullus Colocynthis*" and states that "the seeds should be separated and rejected." The fruit is usually peeled after drying, and the seeds, which are embedded in the pulp, are necessarily separated by mechanical means which may not assure complete separation.

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[3] Am. Jour. Phar., Oct., 1910, p. 454.

* Read at the December meeting of the American Chemical Society, 1911.

Power and Moore[1] found 75.5 per cent. of seeds in Turkey Colocynth. A sample of apples examined in this laboratory was found to contain 74.8 per cent. of seeds. The question arises, "Is it practical to separate all the seeds?" If not, what should constitute a fair allowance of seed in the pulp, and what should be the U. S. P. requirements for the drug?

Pearson,[2] examining two lots of pulp which consisted of pieces and fine powder, found about 2 per cent. of seeds in the pulp, and by comparing the microscopical appearance of the fine powder with that of a sample containing a known proportion of seeds, considered that about 3 per cent. of seeds were present in the powdered material.

We recently examined seven samples of pulp representing 1100 pounds imported from the London market, with the results as shown in table 1.

TABLE 1.

Sample No.	Pulp Per cent.	Seed Per cent.	Peel Per cent.
9548	96.93	1.27	1.80
9674	98.41	1.17	.42
9675	99.05	.79	.16
9676	99.03	.87	.10
9677	99.06	.78	.16
9678	98.94	.48	.58
9679	99.61	.14	.25

The pulp contained very little fine powder and was not examined for seed that could not be detected by the eye. Over three-quarters of the seed by count were undeveloped, and were much lighter and more inclined to adhere to the pulp than the fully developed seeds. It will also be noticed that practically as much peel as seed was also found present.

Making a quantitative examination of the pulp, when in pieces, for seed is a simple operation but if the pulp is in the powdered state, the detection and determination becomes more difficult.

Mansfield[3] describes and illustrates the microscopical appearance of the powdered pulp, powdered rind and powdered seed, aiming to show how readily the seed and the rind tissue may be detected when present. We find in the seed aluerone grains and stone cells, but in the pulp, free from seeds, none, and by careful and patient comparison with a known sample of mixed powdered pulp and seed, an approximate determination may be made.

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[1] *Pub. of the Wellcome Chemical Research Laboratories,* London, Jan. 20, 1910.

[2] *A. Ph. A. Bulletin,* Aug., 1911, 344.

[3] *Drug Circular,* Feb., 1910, 56.

Power and Moore found the seed of Turkey Colocynth when extracted with light petroleum to yield 12.72 per cent. of their weight of fatty oil and by extracting with carbon tetrachloride Grimaldi and Prussia[4] obtained about 17 per cent. of fixed oil from the seed.

Hooper[5] obtained from Baluchistan colocynth seed 17.8 per cent. of a yellow drying oil.

Evans' Sons, Lescher and Webb[6] examined two samples of pulp, free from seeds and obtained 0.2 and 0.4 per cent. respectively of petroleum ether extract, and from four samples of powder 0.7, 1.4, 0.3 and 9 per cent.

The British Pharmacopœia, revision of 1898, requires that "only traces of fixed oil should be removed from the pulp by ether. The pulp after drying at 212° F. should yield at least 9 per cent. of ash indicating the absence of seeds." Dowzard,[7] however, found that Pure Colocynth Pulp yields about 3 per cent. of soluble matter when extracted with ether. He obtained by means of petroleum ether only 1.16 per cent. of extract and from the pulp, so extracted, 2.75 per cent. of soluble matter was subsequently extracted by ether. Six other samples of Colocynth pulp yielded direct to petroleum ether: 0.52, 0.58, 0.6, 0.98, 1.20, 1.33 per cent. of extract.

Havenhill[8] suggests that for Colocynth a limit of petroleum ether extract is desired.

Barclay[9] considers the estimation of ash in powdered pulp to be useful in ascertaining its freedom from seeds. He found the average ash of 8 samples as follows: Pulp 11.45 per cent., seeds 2.37 per cent. and the whole apple 4.6 per cent. Greenish[10] examined 7 samples of Colocynth apple and found in the pulp, free from seeds, from 8.62 to 13.43 per cent. ash, while the whole apple yielded from 4.43 to 5.86 per cent. Roder[11] found a sample of Colocynth (presumably the pulp) with 13.66 per cent. of ash.

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[4] *Boll. Chim. Farm.*, 1909, No. 3.

[5] *Pharm. Journ.*, Aug. 8, 1908, 161.

[6] *Analytical Notes*, 1906–07, p. 15.

[7] *Pharm. Journ.*, Sept. 12, 1903.

[8] *A. Ph. A. Proc.*, 1908, 932.

[9] *Amer. Drug.*, March 10, 1896, 152.

[10] *Pharm. Journ.*, March 30, 1901, 398.

[11] *Jahresbericht, Wien.*, 1908, 81.

A sample of Colocynth apples which contained 74.8 per cent. seed was examined in this laboratory for petroleum ether extract, dilute alcohol extract and ash in the whole apples, the pulp free from seeds, the seeds and a mixture of the pulp and seed. The petroleum ether extract was determined by macerating 2 gms. of the fine powder with about 20 c.c. of petroleum ether for 2 hours with continuous shaking. The mixture was then transferred to a filter and washed, the filtrate evaporated and dried at 100° C. to constant weight. The dilute alcohol extract was determined by macerating 5 gms. of the drug 48 hours and percolating until exhausted. A quantity of the percolate representing 1 gramme of the drug was evaporated and dried at 100° C. to constant weight. The ash was determined using a platinum crucible, at a temperature not above red heat. The results are recorded in table 2.

TABLE 2.

	Pulp Per cent.	Seed Per cent.	Pet. Ether Ext. Per cent.	Ash Per cent.	Dil. Alc. Ext. Per cent.
Whole apples........	25.2	74.8	12.58	3.73	14.22
Pulp	100.0	....	0.44	9.20	43.20
Seed	....	100.0	15.56	1.96	5.20
Pulp and seed	97.0	3.0	1.22	9.02	40.14

The ash is practically all soluble in dilute hydrochloric acid, and contains potassium, sodium, chlorine and carbonates. No other elements were tested for. Hence the necessity of avoiding a high temperature on incinerating since the potassium and sodium chlorides may be volatilized. The rind contains about the same amount of ash as the pulp.

Three of the samples of pulp previously referred to in table 1 and three samples of powdered Colocynth were examined in the same manner, the results being recorded in table 3.

TABLE 3.

Sample	Pet. Ether Ext. Per cent.	Ash Per cent.	Dil. Alc. Ext. Per cent.
Pulp No. 9548 with seed and rind........	0.77	13.03	42.55
Pulp No. 9548 without seed and rind....	0.65	13.03	43.46
Pulp No. 9674 without seed and rind....	1.05	12.68	40.00
Fulp No. 9675 without seed and rind....	0.64	12.10	42.75
Powder No. 9395........................	4.40	6.12	29.49
Powder No. 9510........................	1.21	9.87	31.00
Powder No. 9511........................	0.74	12.68	39.51

The sample of powder, No. 9395, examined microscopically, contained aleurone grains and stone cells from the seed and stone cells characteristic elements of the peel. The high petroleum ether extract and low ash obtained indicate without a doubt that the powder contained an excessive amount of seed. The dilute alcohol extract was also low but then sample No. 9510 contained only 31.90 per cent., while the amount of petroleum ether extract and ash indicate that it did not contain more than 2 or 3 per cent. of seed. The number of aleurone grains found, indicated even less when compared with the sample of pulp No. 9548 with seed and rind, and pulp containing 3 per cent. of seed. Sample of powder No. 9511 contained practically no aleurone grains but contained the characteristic stone cells of the rind.

Conclusions.

Commercially the pulp cannot be entirely freed from seeds, but it can be obtained containing less than 2 per cent. of seeds. The pulp may also contain pieces of the rind.

The presence of seed and rind in the powdered pulp can be readily detected (with the microscope) by the presence of aleurone grains and their respective characteristic stone cells.

The seeds contain a large amount of fixed oil which is extracted by petroleum ether while the pulp free from seed yields usually less than 1.0 per cent. petroleum ether extract.

The seeds contain not more than 2.0 to 2.5 per cent. of ash while the pulp contains from 9.00 to almost 14.00 per cent. which is soluble in dilute hydrochloric acid.

In view of the above conclusions, we suggest that the ninth revision of the U. S. Pharmacopœia require that Colocynth should not yield more than 1.5 per cent. of petroleum ether extract and contain not less than 9 per cent. of ash soluble in dilute hydrochloric acid. These requirements would apply more to the powder than to the pulp in pieces. We would also suggest that Colocynth be defined as "the pulp of the peeled dried fruit."

Analytical Department, Schieffelin & Co., New York.
December 5, 1911.

DIGITALIS

Its Cultivation, Collection and Preparation.

By Edwin L. Newcomb, P.D.

Department of Pharmacognosy, College of Pharmacy, University of Minnesota.

The production of the drug digitalis from cultivated plants is a subject which merits the attention of workers in the different sections of the country. The need for such work is indicated by the following references which it seems well to quote at this time: Tschirch,[1] in a number of papers, has discussed the cultivation of medicinal plants and the effects of various soils and other factors upon the therapeutic quality of the drugs produced. He quickly eliminates the theory that drugs from wild plants are better than those from cultivated plants by the statement that the theory rests in a lack of knowledge of methods of cultivation that produce the largest amount of product value.

The researches of Chevalier[2] indicating that nitrogenous fertilizers increase the alkaloidal value of belladonna and that potassium and phosphates are without effect on the plant in this respect are of importance and indicate that uniformity in drugs from cultivated plants can probably come only after a thorough understanding of the effects of various fertilizers upon drug plants.

A most valuable communication on "The Variations in the Activity of Certain Toxic Drugs with Suggestions for an International Inquiry" was presented by McEwan and Forrester[3] to the Section on Pharmaceutical Chemistry of the Seventh International Congress of Applied Chemistry, which met in London in 1909. The authors suggested along with other lines of work:

1. Studying and recording data concerning climate, soil and other factors characterizing the localities where the drugs are grown and harvested for commercial purposes.

2. Periodical chemical analyses of the parts of the plants used medicinally to ascertain whether the parts are harvested at the proper times. After a large amount of international correspondence the authors conclude that different climatic conditions are responsible for variations in the constituents of plants of the same species in their respective habitats and that the constituents

vary according to the stage of growth the plants have reached. They also give particulars regarding the cultivation and collection of aconite leaves and root, belladonna leaves and root, digitalis leaves and henbane.

This brings us to the consideration of the cultivation of medicinal plants with a conception of what the work really means, quite different from that held by the apothecaries of early times. The work is far from simple plant culture as many are inclined to regard it and involves investigations that will require years before we will be able to solve the mysteries of the chemical laboratory of the plant. One does not have to work long with plants before he realizes the truth of what Prof. H. Thoms[4] has recently said: "The plant is a better chemist than we are, has better laboratories than we have. We must study conditions of growth, we should appoint a committee to inquire, to find out how to compel the plant to produce a definite amount of alkaloid."

The soil and climatic conditions in which medicinal plants grow natively are important considerations and only after a careful study of these and other conditions have some of our medicinal plants been successfully cultivated. Chevalier[5] states that "Where a reduction of activity occurs it is solely due to the fact that cultivation is largely carried on without regard to the natural conditions and soil." We have every reason to believe that future research will disclose methods of culture, etc., which will yield drugs of far greater value and uniformity than are now obtainable.

Our work in the cultivation of medicinal plants at the College of Pharmacy of the University of Minnesota has been directed first to develop conditions for the various plants approaching those under which they naturally grow and then to study the effects of variations, selections, breeding, etc., with the end in view of increasing the educational facilities of the College.

Although *Digitalis purpurea* is probably indigenous to central and southern Europe, it is said to be naturalized now in California, Oregon, Washington and West Virginia. The soil in which digitalis seems to thrive best has been very well described by Holm[6] who says: "Foxglove grows best in well drained, loose soil, rich in leaf mold, but it does not grow in calcareous soil. It will grow either in shade or sun, but prefers a moderate amount of sun. Although naturally a biennial, after flowering young shoots will develop between the radical leaves and form three or four large flowering stems during the third year. In suitable soil it readily renews itself by seed."

The plots devoted to digitalis culture received a fair amount of sunlight. The soil consisted of a loose sandy loam mixed with several inches of peat which had been upon the ground for a number of years. The sub-soil was sandy and so porous that water would remain upon the surface for only a short time after heavy rains. From recent examinations of peat by Schoor,[7] Hoff,[8] and others, it seems that this substance, although differing somewhat chemically from leaf mold, may largely supply what plants naturally acquire from the latter. The growth of the plants indicated that the soil conditions were very suitable. A large number of young seedlings came up in close proximity to a number of seeding plants.

The following local climatological data are recorded because of the probable effect of climatic conditions upon the constituents of plants. With such data and some knowledge of the character of the soil one can judge in a general way which plants would be likely to grow successfully in a given locality, although it must be borne in mind that practically all plants possess some power of adaptation and that the most luxuriant plants may not always produce the most valuable drug.

CLIMATOLOGICAL DATA COVERING THE GROWING SEASON, MINNEAPOLIS, MINN., 1911, LATITUDE 44° 59′ NORTH, LONGITUDE 93° 18′ WEST.

Months	Temperature			Precipitation	
	Maximum	Minimum	Mean	Precipitation	Dep. from Normal
April	79	15	45.8	2.55	0.11
May	92	30	63.6	4.10	*0.18
June	98	50	73.1	6.93	*2.92
July	99	50	71.1	4.62	*0.81
August	89	45	66.6	3.65	−0.04
September	88	41	59.2	5.83	*2.17
October	72	23	45.8	6.42	*3.84

* Equals excess above normal precipitation.

The mean temperature for May and June was 5.8 degrees in excess of the normal temperature for these months. During the other months of the growing period the temperature was slightly below normal. A total of 34.1 inches of rain fell during the growing period which was 10.03 inches above the normal precipitation. During the months of September and October, when the leaves of digitalis were collected, the precipitation was much above normal as is indicated by the accompanying table. The last killing frost in the spring occurred on May 2d and the first in the fall on October 22d. During the year there were 153 cloudy days, 92 partly cloudy and 120 with sunshine. Water was supplied by means of a hose and sprinkler when required.

The germination and planting of Digitalis have been considered in an earlier paper.[9] The early part of the past summer was exceedingly hot. In order to keep the plants from wilting badly it was necessary to water them abundantly each day. With this treatment they grew quite well. A wet season began the latter part of August and from this time on until frost the plants made a remarkable growth.

The plants do best if transferred from the cold frames to the open during a wet cloudy spell. They should be well watered when transplanted during a hot and dry time. With proper care the plants are very hardy after they once become rooted. Experience in the growing of Digitalis for a number of seasons in New Jersey and more recent observations in Minneapolis indicate that the plant will stand any ordinary amount of dry weather without serious injury, although during such periods the amount of foliage produced is much less than under more favorable conditions.

The young leaves of the first year's growth arise directly from the crown of the plant and hence are situated close to the ground. They are exceedingly tender when they first appear and easily injured or retarded in their development by having soil thrown over them or by being covered with water for some time. For this reason the level of the plots containing the plants should be a few inches above that of the surrounding paths. In case the plants are to be cared for by means of a horse and cultivator, they should be planted on ridges a few inches high and an equal distance apart each way (about nine decimeters) so that cultivation may be carried on in each direction. No fertilizer whatever was applied to any of the plots. Chemical examinations are being made of the soil in the various plots and these with a study of the characteristics of the ash of the drug produced will be considered in a subsequent paper. It may be stated at this time, however, in view of the recent work by Burmann[10] that the ash contains manganese. This was also true of a sample of digitalis leaves collected from plants growing wild in the State of Washington. Examinations of three different samples of imported digitalis leaves gave positive reactions for manganese.

The plants growing outside appear to be quite free from the attack of aphis, black beetles or other insects injurious to the foliage of many plants and with the exception of four or five which turned yellow and appeared affected by some pathological condition, they presented a very healthful appearance, many of them measuring two feet across. The size of the plant of course is largely determined by the conditions under which it grows. It is interesting to note that Jenner[11] observed a digitalis plant growing upon stable manure in Canada which was upwards of eight feet high and had leaves fully a foot in length. A plant I had under observation in New Jersey a few years ago produced four flowering stalks during the third year's growth, the tallest of which was six feet high.

Attention has been called to the fact that plants during their second year's growth frequently send up shoots from between the basal leaves and that these secondary shoots produce flower stalks during the third year. These lateral developments are in the nature of new plants which resemble first year plants grown from seed. Under favorable conditions these secondary shoots are frequently produced during the first year's growth, this being especially true if the seeds are sown early in a greenhouse. Observations during the past year upon a plot of two-year-old plants indicate that it is difficult to tell which leaves are from the old crown and which from the new shoots, except when the flower stalk is present. It is also to be noted that the plants may not blossom at all during the second year, probably because of unfavorable growth conditions. A well drained sandy plot free from peat was planted early in the spring with one-year-old plants. Although well watered during the early dry spell the plants made a poor growth; a few produced weak flowering shoots; a number died and the twenty odd remaining plants which held their own were transplanted at the end of eight weeks into a peat loam plot. They immediately began a more vigorous growth and about half of the remaining plants flowered before frost. All of these plants produced numerous secondary shoots. Another plot with sand-gravel soil free from peat was filled early in the spring with nine-months'-old vigorous plants. These made a good growth and had a healthy appearance, but produced no flowers or lateral shoots.

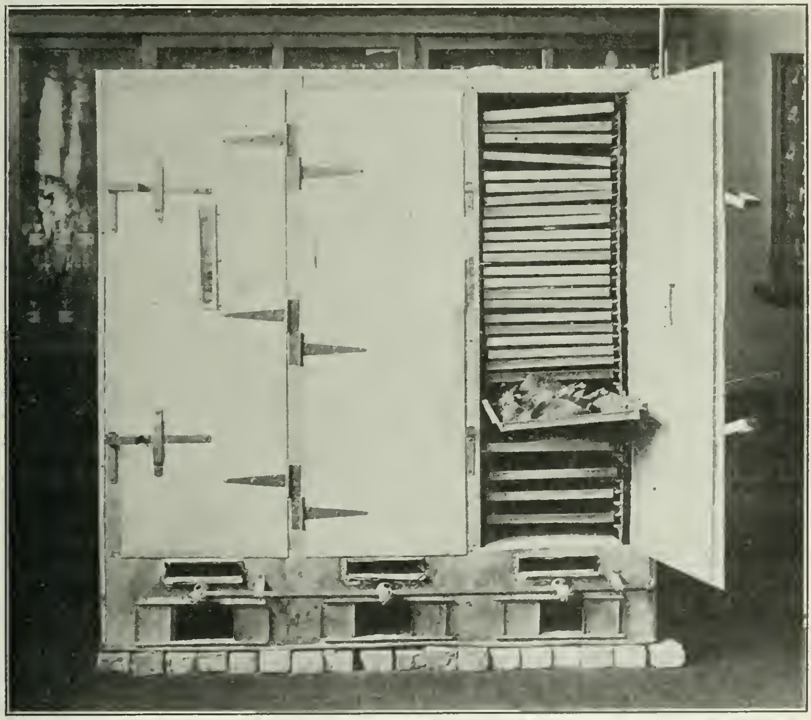
From these observations it would seem that collectors very likely secure some leaves that are not developed from the second year crown and that much of the drug on the market probably consists of a mixture of the leaves from the first year lateral shoots and the old second year crowns.

A review of different pharmacopœial definitions for Digitalis reveals the fact that for many years most pharmacopœias have directed that the leaves should be collected at the time the plant flowers, although it is doubtful if this requirement has ever been based upon the results of comparative valuations of the medicinal quality of leaves of the first and of the second year's growth. The pharmacopœias of ten different countries require Digitalis leaves to be collected from plants of the second year's growth and five require the leaves of wild-growing plants. Ten pharmacopœias define the time of collection—seven stating "at the commencement of flowering," and three, "when in flower." Eleven require the drug to be renewed yearly and three give a test to demonstrate the presence of the active principles.

Farr [12] considers the leaves of the second year as rather more potent, although the first year leaves contain a larger percentage of petioles which may account for the slight difference. Hart [13] reported an interesting series of experiments which indicate that the first year's leaves are more valuable than those of the second year and that careful drying is essential. Hale [14] reported on the examination of first year leaves grown at Madison, Wis., Arlington, Va., and Seattle, Wash., all of which were more active than selected English leaves of the second year's growth. Many others have expressed the opinion that first year leaves are probably just as valuable as those gathered during the second year's growth. Cæsar and Loretz [15] have pointed out that leaves collected during a wet season are less toxic than those gathered from the same locality during a succeeding warm and dry spell. The same workers considered the effects of drying Digitalis in different ways and conclude that preliminary sterilization by steam is detrimental to the activity of the drug and that leaves quickly air-dried show the greatest physiological value. They conclude also that it is immaterial whether the leaves are collected from first year or flowering plants, but that the time of collection is important. The leaves from plants of the second year's growth are usually collected in July, while the first year's leaves attain their full physiological action after August. The latter, they state, not only equal but often surpass in activity the leaves of two-year plants.

The importance of the proper drying and preservation of digitalis leaves has been pointed out by a number of workers, although the temperature at which the leaves should be dried and the method of carrying on the work has not received the attention that it seemingly deserves. Wang,[16] Cæsar and Loretz,[17] Wippern,[18] Focke [19] and others believe that there is a distinct deterioration in the medicinal value of the drug unless carefully preserved. The general consensus of opinion at the present time seems to be that there is very little change even after the elapse of several years

FIG. 1.



One of the large ovens for quickly drying digitalis leaves.

in the activity of the drug if it is quickly dried to a moisture content of about three per cent. or less and kept in air-tight containers with a small amount of unslacked lime. The hygroscopic character of the leaves demands artificial heat with but probably few exceptions during the drying process in order to properly prepare the drug. To determine the effects of various temperatures upon the physiological activity of the drug during the drying process, Hale[20] carried out a number of experiments and recorded results showing that the action of the drug is not lessened materially unless the temperature exceeds 120° C.

Results like the foregoing lead one who is familiar with the drug to believe that the variations in the medicinal quality of Digitalis are more likely to be due to a lack of uniformity in the methods of collecting, drying and preserving than to the use of first year leaves, and that pharmacopœial definitions should be changed and directions given for the proper manner of handling the drug. The adoption of the following general rules which are a modification of those presented a few years ago by K. Alpers[21] should go a long way towards securing Digitalis of uniform strength:

1. The stock of digitalis leaves should be procured shortly after the leaves are gathered by reliable parties who make a specialty of this work; or, if possible, the leaves should be collected personally.

2. The leaves should at once be dried as completely as possible in a well ventilated drying-closet at a temperature not exceeding 100° C. and then at once enclosed in air-tight receptacles containing small amounts of freshly burnt lime.

3. Finely powdered Digitalis should be kept in small quantities only so that it may be consumed in a short time. This powder may be kept in glass containers carefully stoppered, and containing freshly burnt lime properly held.

Before considering the various experiments carried out in the drying of the leaves grown during the past summer, it may be of interest to give a few notes upon the collection. This work began September 1, 1911, and was carried on almost entirely by students, who found the work not only interesting but primarily instructive. The leaves collected were all from plants of the first year's growth with the exception of a few from a small plot containing two-year-old plants. A rather long-bladed sharp knife proved to be the most suitable instrument for cutting the leaves from the plant, the collector grasping a handful of the thick foliage with the left hand and with one stroke of the knife severing from six to twelve leaves. Care was exercised to cut those leaves which had apparently reached the most active photosynthetic stage. The older slightly yellow leaves were collected separately or rejected and the young leaves were left to grow. The collection from flowering plants is somewhat more tedious as has been pointed out by True [22] due to the fact that some of the leaves are scattered along the flowering stalk and have to be gathered one at a time. One noticeable thing in connection with the collection of the leaves was that the hands of the collector became sticky, probably from the exuding contents of the glandular hairs as the cut surfaces of the petioles seldom came in contact with the operator. Investigations are in progress to determine the character of this exudate. The average weight of select fresh leaves taken from each of the one-year-old plants was four hundred grammes. In addition to the select leaves an average of one hundred grammes of yellow or slightly yellow leaves were taken from each plant, some of which were reserved for assay. Only about one-third of the total crop of leaves suitable for drug purposes was collected.

The plants continued to grow rapidly after the first leaves were cut and within four weeks time there were a large number of mature leaves developed. Only a few of these were cut for fear that the plants would be more likely to winter-kill if they were deprived of their foliage at this time. Two crops could probably be gathered if the first were gathered in August. The importance of the time of collection, however, must not be overlooked and further investigations are necessary before it can be stated that the leaves which develop during the cooler weather are similar or equal in medicinal value to those which grow in the warmer months. In view of recent results showing that leaves collected during a wet period are less active than those collected during a dry spell, it should be noted that the months of September and October were characterized by very frequent rains.

The plants were under close observation during the growing and collecting season and the following notes may be of interest: The leaves of *Digitalis purpurea alba* appeared to be uniformly lighter in color than those of the other varieties, while the leaves of *Digitalis purpurea monstrosa* are uniformly somewhat more narrow. It was also noticed that certain plants in each of the different plots produced foliage quite different from that of the surrounding plants. Some of the plants were characterized by having leaves with purplish spotted petioles while others did not show these at all. This marking seemed to predominate in the darker flowering varieties. Several hundred transverse and surface sections of leaves of each of the different varieties of *Digitalis purpurea* including *monstrosa* were made and examined. Although the growing plants of the several forms presented a somewhat different appearance the leaves resembled each other very closely histologically. It was noted as has been pointed out by Kraemer[23] that the leaves of certain plants possessed many more glandular hairs than those of other plants. This difference did not seem to be characteristic of any one variety. An attempt is being made to follow up these plants in which glandular hairs predominate and determine whether the leaves collected therefrom are more valuable medicinally. A number of abnormal forms of leaves were found among the plants. These had two distinct mid-ribs and a more or less bifurcate lamina. One plant produced two of these abnormal leaves, each having equally divided lamina and a conical hollow petiole. Only eight or ten such monstrosities were found among about twelve hundred plants under observation. It is probably rather early to predict the bearing of such characteristics upon the value of drugs produced from these plants, but it is not unlikely that future work in plant breeding and other selective processes will develop pharmacognostical strains differing widely from each other therapeutically, but which botanically may be identical. Tschirch[24] in considering physiological varieties in a recent paper refers to the subject as follows: "The plant producing Siam benzoin, which contains benzoic acid alone, cannot be distinguished by any botanical characteristics from the plant which produces Sumatra benzoin, which contains cinnamic acid with benzoic acid. ——— Indian cannabis can only be distinguished from European cannabis by its greater production of resin and the bitter almond from sweet almond only by the presence of amygdalin. These differences are physiological and chemical."

The fresh digitalis leaves were taken directly into the laboratory after each collection. A portion of each sample was used for the preparation of a fresh tincture according to the U. S. P. formula for tincture of fresh herb and the remaining quantity was dried by one or more of the following methods:

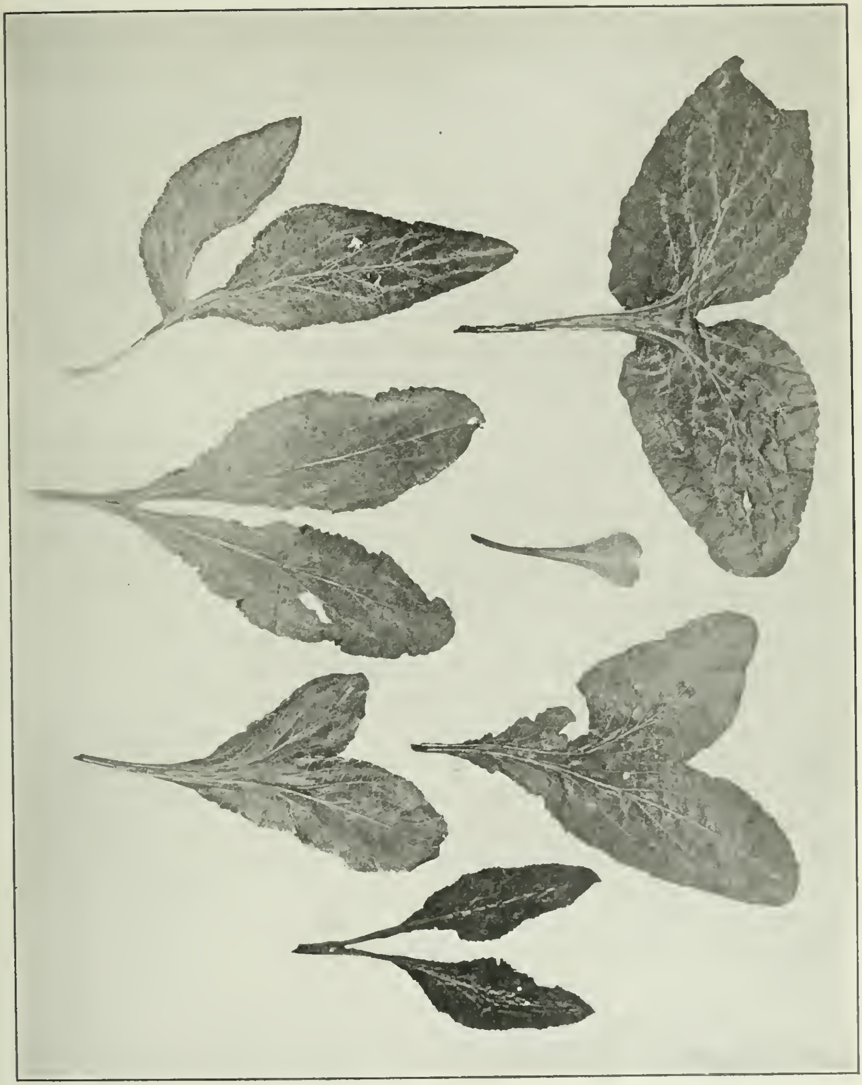


FIG. 2.

Abnormal forms of leaves of *Digitalis purpurea*.

1. Air dried—The leaves were spread out about one layer deep upon the laboratory tables. At the end of nineteen days they were still so moist that they could be rolled up without crumbling. The drying was completed by spreading the leaves upon window screens and applying artificial heat beneath.

2. Artificial heat, leaves spread out in the open—In this case the leaves were spread six or eight layers deep upon window screens, sand-baths provided with gas burners were placed about eight inches below the screens. It was found necessary to spread the leaves much more in order to complete the drying within three days as desired. A uniform temperature was difficult to secure by this method of drying.

3. Artificial heat, small hot air ovens—An attempt was made to quickly dry the leaves at 100° C. by placing them in small hot air ovens. This changed the color of the leaves to a dark brown. The drying was comparatively slow.

4. Artificial heat in fume closet with hot air current—The leaves were placed one layer deep upon screens stacked one above another in a large fume closet. Heat was applied by means of sand-baths provided with gas burners and placed in the lower part of the closet. A temperature of from 75° to 100° C. was maintained from eight to ten hours a day. By this method the leaves were dried to a moisture content of about four per cent. in three days and without losing their rich green color.

5. Artificial heat, double walled drying ovens—The leaves were placed one layer deep upon the 17 x 28 inch trays, the larger oven holding ninety trays and the smaller one sixty. The ventilators and drafts were opened wide. A charge of about one hundred pounds of fresh leaves was placed in the ovens at one time, and a nearly uniform temperature of 100° C. mantained eight hours a day for three days. In this manner about fifteen pounds of dried leaves containing about four per cent. of moisture and retaining their green color were produced from each charge.

The last two of the five methods of drying seem particularly suitable in that the leaves are quickly dried at a temperature which probably destroys the ferments, fixes the green color and does not injure the active principles. The use of the large drying ovens is to be preferred as the temperature can be more accurately controlled, thus lessening the possibility of breaking up the constituents by excessive heat. It was noted that the very yellow leaves dried more quickly than those which were slightly yellow and the latter more rapidly than the select green ones; young immature leaves required a still longer time to dry.

Moisture determinations were made on a large number of samples. These showed that an average of eighty-five per cent. of moisture was lost upon drying. The results of certain investigators indicate that the petioles and mid-ribs contain less of the active principle than the lamina. These parts may be largely removed from the dry drug by sifting the more or less broken leaves through sieves having about five meshes to the linear inch. The laminated petioles were separated from one lot of fresh leaves and the petioles lost ninety per cent. of moisture on drying, while the lamina lost eighty-six per cent.; the separated petioles represented thirty-three per cent. of the total weight of the dried drug. One lot was partially dried and then the petioles and mid-ribs were stripped from the lamina; the lamina represented about fifty per cent. of the weight of the dried drug.

The drug prepared during the past year was transferred directly from the driers to tin cans holding about one pound each. A one-ounce wide-mouth bottle filled with freshly burnt lime and covered with gauze was placed in each can. The different species and varieties of digitalis, which have been grown, and the leaves collected and prepared by the various processes described include the following: No. 46 *Digitalis lutea*, No. 48 *Digitalis purpurea maculata superba*, No. 50 *Digitalis lanata*, No. 51 *Digitalis grandiflora*, No. 53 *Digitalis purpurea* mixed, No. 54 *Digitalis ferruginea gigantia*, No. 56 *Digitalis purpurea monstrosa* mixed, No. 57 *Digitalis purpurea alba*, No. 60 *Digitalis purpurea* mixed and No. 49 *Digitalis purpurea rosea*. It is probable that much of the drug sold as Digitalis at the present time consists of the leaves of the different varieties of *Digitalis purpurea*.

The medicinal value of the drug prepared is being carefully studied by chemical and physiological assays and will be reported upon in a later paper. It may be stated at this time, however, that the tests thus far completed indicate that the quality of the carefully prepared drug is probably equal to that of the best drug on the market. Unfortunately a method for the assay of Digitalis has not as yet been introduced into the U. S. P. Pharmacists can do a great deal, however, to insure themselves of having digitalis preparations of uniform quality by paying particular attention to the manner in which the drug is dried and the conditions under which it is preserved. Practically all investigators agree that the drug should be quickly dried and preserved in air-tight containers with a small amount of freshly burnt lime or other suitable material. By taking this precaution a vast amount of good will be accomplished.

REFERENCES.

[1] Tschirch: *Pharmaceutical Era,* vol. xlii, p. 649; vol. xliv, p. 478.
[2] Chevalier: Jahresb. d. Pharm., Götting., vol. 45, p. 75.
[3] McEwen & Forrester: *Chemist and Druggist,* vol. 74, p. 877.
[4] Thoms: *Chemist and Druggist,* vol. 74, p. 879.
[5] Chevalier: *Pharm. Ztg.,* iv, 1910, No. 39, p. 397.
[6] Holm: *Pharm. Journal.,* 1905, p. 5.
[7] Schoor: *Journ. Am. Peat Soc.,* vol. 3, 1911, 226–32.
[8] Hoff: *Journ. Am. Peat Soc.,* vol. 3, 1911, 192–201.
[9] Newcomb: Am. Journ. Pharm., vol. 83, p. 526–33.
[10] Burmann: *Schweiz. Wochschr.,* 1911, p. 562.
[11] Jenner: *Canad. Druggist,* 1905, vol. 17, p. 406.
[12] Farr: *Pharm. Journ.,* 1907, p. 198.
[13] Hart: *Pharm. Journ.,* 1908, p. 440.
[14] Hale: Bull. No. 74, Hyg. Lab. U. S. Pub. Health and Marine Hosp. Serv., Wash., p. 27–28.
[15] Cæsar & Loretz: Halle, Geschaftsbericht, 1910, p. 23.
[16] Wang: *Apoth. Ztg., Berlin,* 1906, vol. 21, p. 890.
[17] Cæsar & Loretz: Geschafts., Berlin, 1906, p. 29–31.
[18] Wippern: *Apoth. Ztg.,* Berlin, 1906, vol. 51, p. 807.
[19] Focke: *Apoth. Ztg.,* Berlin, 1906, vol. 21, p. 580.
[20] Hale: Bull. No. 74, Hyg. Lab. U. S. Pub. Health and Marine Hosp. Serv., Wash., p. 30–31.
[21] Alpers: Pharm. Ztg., vol. 67, p. 703–05.
[22] True: *Oil, Paint and Drug Rep.,* 1906, vol. 70, Oct. 17, p. 37.
[23] Kraemer: Amer. Journ. Pharm., vol. 83, p. 365.
[24] Tschirch: *Pharmaceutical Era,* vol. 44, p. 479.

SOME POINTS IN RELATION TO MEDICAL AND PHARMACAL LEGISLATION.

By F. E. Stewart, Ph.G., M.D.

I was invited to take part in a discussion of a paper by Dr. Henry Beates, Jr., so well-known in connection with his presidency of the Medical Examining Board of the State of Pennsylvania, upon the subject "A Consideration of Some of the Causes that are Determining the Decline of Medical Practice and Causing the Public to Lose Confidence in the Physician." This discussion occurred at the meeting of the Northern Medical Association of Philadelphia, Friday evening, February 9, 1912, at the hall of the Northern Dispensary.

In the afternoon of the same day, Mr. John C. Wallace, ex-president of the Pennsylvania Pharmaceutical Association, read a most interesting paper before the Philadelphia College of Pharmacy on "Pharmaceutical Legislation." This paper contained an excellent review of the various laws now before Congress of the United States and the various States of the Union. As his paper was right in line with the discussion in which I expected to take part in the evening, I read my remarks before the College.

Now, as these various subjects which seem to be so diverse are really parts of a whole and relate to the very question under discussion by Dr. Beates, I wish to call attention to the principles underlying this class of legislation for the purpose of showing some of the reasons why the medical and pharmaceutical professions are losing prestige in the eyes of the community.

First, let us recall the history of the medical and pharmaceutical professions as to their origin, functions and also to the belief of the people relative to the ability of the physician to cure the sick and their faith in the power of the substances used for that purpose, known as drugs.

The medical profession had its origin during the tribal stage of civilization. The medicine man was a religious dignitary, his influence over the tribe being that of fear, rather than of awe and spiritual dignity. The Indian medicine man dispensed his own medicines, carrying them around in a "medicine-bag," consisting of a pouch containing charms and other apparatus of his magical arts. In the Mosaic economy, the priest was lawgiver and physician. Kitto says that nothing is more certain than the essential identity among all ancient nations of the professions—religion, law and medicine, which the progress of civilization has separated into three.

Turning to the history of European civilization, we find that in ancient times service in the church was the only profession recognized by State and people. Tracing the history of medicine in England, we find that medicine and law were practiced by the priests. After a time, surgery was forbidden the priests because it involved the shedding of blood, which the church abhorred, and it was relegated to the barbers. Hence we have the barber's pole, representing a white bandage entwined around a bloody limb. A class of barber-surgeons arose, characterized by ignorance and venality. Finally, as medicine gradually separated from the church, the medical profession redeemed surgery from the barbers, and in the course of time it became the most scientific branch of medical practice.

Physicians in early times dispensed their own medicines which were prepared for them by their apprentices. As knowledge advanced, chemistry displaced alchemy and the chemical investigation of materia medica products made pharmacy complex, and it was relegated to the apothecaries.

The ancient apothecary dispensed his herbs and ointments to an ignorant and credulous public. When the duty of serving the medical profession was relegated to the apothecaries, the vocation gradually separated into two classes, one class being educated in chemistry and professional in character, and the other class retaining its ancient character.

When the vocations commenced to organize into guilds, the apothecaries belonged to the guild of grocers. Physicians ranked higher socially than surgeons because of educational qualifications. The surgeons obtained their training from apprenticeship.

History teaches us that the confidence of the public in physicians and medicine was due in the first place to ignorance and credulity. This was replaced in time by reverence, owing to the higher conception of medical service. The service of the physician-priest was pre-eminently altruistic. No fees were charged for services rendered. The physicians were supported by the church, and the church in turn supported by the people as an act of worship. When medicine separated from the church and became a money-making vocation, it gradually declined in public esteem. The public has lost confidence in the physician just in proportion to their belief that the physician is animated by selfish rather than altruistic principles. As the medical profession now exists, it can be said with considerable truth that the public has lost confidence in medicine because it is no longer an altruistic profession, but a commercial business.

In this discussion, medicine must be considered under its several meanings as defined by the dictionary. Medicine is not only defined as the healing art, but also as a science of the preservation of health and of treating disease for the purpose of cure. Preventive medicine has every right to lay claim to altruism, and therefore the medical profession can still claim to be altruistic, in so far as it deals with the prevention of disease.

Where the medical profession has lost out is in that part of medicine which relates to the treating of disease. Therapeutic nihilism is prevalent throughout the medical profession of the world. The knowledge of the causes and nature of what we call disease has gradually increased, but the profession freely confesses its impotence to cure. The popularity of Christian Science, the Emanuel movement, faith cure and other cults which include religion and medicine is not surprising. These cults give the people what they want, namely, a medical service in which reverence, respect, awe and affection, and worshipful regard are blended. The service rendered by the old family doctor described in Watson's " Bonnie Briar Bush " was of a character that called forth such feelings of regard. We find in the Hippocratic Oath and in the Oath and Prayer of Maimonides a recognition of the same altruistic principles of service.

The dictionary gives another meaning to medicine, namely, a substance reputed to possess curative or remedial properties. From the very earliest times, the people have had a most abiding faith in the healing power of medicines themselves, irrespective of the physician or the apothecary. Faith in drugs, druggists and doctors has been terribly shattered by the revelations which have resulted in the passage and enforcement of the pure food and drug laws by the national and state governments. The fact that such laws are necessary has come as a shock to the people. This feeling of distrust has been largely increased by the attacks of the *Ladies' Home Journal*, *Collier's Weekly* and other popular magazines.

While it is true that the credulity of the public in relation to the value of drugs as remedial agents has departed never to return, yet the medical profession is not ready to accept as true the saying that " mankind has been drugged to death, and the world would be better off if the contents of every apothecary shop were emptied into the sea."

Another potent factor in destroying the confidence of the public in drugs is the misleading system of advertising of drugs in vogue at the present time. During the past thirty years, tens of thousands of alleged new remedies have been introduced by advertising, and not more than one-tenth of one per cent. of them have proved of any therapeutic value whatever. This objectionable system of advertising has not been confined to the so-called patent medicine business by any means. The medical press and the manufacturers advertising their products to the profession are equally culpable. Introducers of alleged new remedies posing as medical scientists and using the medical societies and press for self-advertising are equally to blame. This condition of affairs could never have occurred if the professions of medicine and pharmacy as custodians of the materia medica had been true to their obligations toward the public. This system of advertising is protected in a large measure by the patent and trademark laws, which, as now administered, have created lasting monopolies in materia medica products. The object of the patent law is not to create monopolies except in so far as such monopolies permit progress in science and useful arts. No person acquainted with the manner in which our patent laws are now administered would have the temerity to claim that progress in the science of medicine and in the useful parts of pharmacy and drug therapeutics is being promoted. The object of the trademark law is to protect the public from the fraudulent substitution of one brand of goods for another. We all know that this object is not being accomplished, and that, on the contrary, a system of lasting monopoly is being built up under the protection of the trademark law.

Want of integrity on the part of certain pharmacists guilty of fraudulent substitution is another potent cause of loss of public confidence. This condition especially maintains in our great cities where the practice is alarmingly prevalent. It seems to be largely confined to the poor sections, although existing in other sections also. Fortunately, the condition thus far is the exception rather than the rule, but the evil seems to be extending. Those who are guilty are throwing discredit on the entire fraternity and laws ought to be passed making fraudulent substitution a crime punishable by fine and imprisonment.

It would be of immense advantage to both professions and to the public at large if confidence in the materia medica could be restored—not that confidence founded upon credulity but resulting from the co-operative investigation of the materia medica and the proper standardization of all substances used in the treatment of disease.

Drug standardization consists of fixing a nomenclature for medicinal drugs, chemicals and pharmaceutical preparations; it consists in adjusting finished products to fixed standards and in devising means for keeping them there for a sufficient length of time to permit their proper application as therapeutic agents; it consists in reducing this knowledge to law and embodying it in system, and then teaching it in medical and pharmaceutical colleges, universities and journals; it consists in legislation limiting the practice of pharmacy to pharmacists and therapeutics to physicians, and forcing them to conduct their respective vocations in a professional manner.

There are before Congress a number of bills intended by their authors to limit the practice of medicine and pharmacy to persons who are qualified by education and license. It is hoped that by this means much can be done in the way of restoring the confidence of the people in drugs as remedial agents. It is believed that one good reason why the public has lost confidence in drugs is due to the fact that they have not been properly used as medicines owing to lack of teaching of materia medica and drug therapeutics in the medical colleges and also to the want of knowledge on the part of people who medicate themselves, and also to the ignorance of drug therapeutics on the part of those who are in the drug business, especially those who are advertising medicines to cure the sick or recommending them over the counter to the self-medicating public.

The principles underlying proper medical and pharmacal laws were laid down by the Supreme Court of the United States in the case of Worden *vs.* California Fig Syrup Co., No. 35, October term, 1902, as follows:

> "Most, if not all, the States of this Union have enactments forbidding and making penal the practice of medicine by persons who have not gone through a course of appropriate study and obtained a license from a board of examiners; and there is similar legislation in respect to pharmacists. And it would seem to be inconsistent and to defeat such salutary laws, if medical preparations, often and usually containing powerful and poisonous drugs, are permitted to be widely advertised and sold to all who are willing to purchase. Laws might properly be passed limiting and controlling such traffic by restraining retail dealers from selling such medicinal preparations, except when prescribed by regular medical practitioners."

The bills before Congress referred to are in the main in harmony with the Supreme Court's position on this subject, but they all need amending before being enacted into law.

I do not take it that the Supreme Court intends to exclude the proper use of simple remedies for domestic practice. The objection to the use of drugs for self medication is not only due to the fact that skill is required in the employment of drugs, but especial knowledge is necessary for diagnosis. A person with abdominal pain may be suffering from a simple colic or an appendicitis. It is therefore important that the people should be taught how to use simple remedies for proper self medication, and the medical and pharmaceutical professions should co-operate to that end.

Now if the medical and pharmaceutical professions and the manufacturers engaged in the pharmacal and chemical arts would unite and co-operate for the purpose of securing proper legislation relative to the practice of medicine and pharmacy, we would probably secure legislation of the greatest value to all concerned. Drugs are not commodities like dry goods and groceries. The drug business has no excuse for existence except to the extent that drugs can be employed for the medication and cure of disease. The questions involved are those of life and death. Misleading statements regarding the therapeutic properties of drugs can only have one effect in the long run, and that is to destroy the confidence of the persons who are misled by reading them.

It is time for all concerned to consider the question of medical and pharmacal service in the light of history. As Dr. Beates very clearly pointed out, medical practice is seriously declining and the public is losing confidence in the physician and in drugs. This not only applies to America, but to other countries as well, and especially so to countries where medicines are freely advertised for sale to all who are willing to buy.

This loss of confidence is liable to be followed by very drastic legislation, emanating from the public itself, unless those engaged in the practice of medicine and pharmacy and in the materia medica supply business give the public the kind of service required to restore public confidence.

CORRESPONDENCE.

American Medical Association.

Council on Pharmacy and Chemistry.

To Manufacturers of and Dealers in Medicinal Products:

Gentlemen:—The Council on Pharmacy and Chemistry of the American Medical Association, since its organization, has been obliged to refuse recognition to a number of otherwise unobjectionable preparations, because their names were considered detrimental to the best interests of the public and the medical profession. In the hope that in the future those who introduce new remedies may see their way clear to adopt names which will not be open to objection, the Council has decided to issue this explanatory statement to the manufacturers of medicinal substances.

The trade names of pharmaceutical preparations or mixtures should be so framed as to indicate the most potent ingredients. An article whose name gives a false impression in regard to its identity or origin or which is in other ways misleading would not be acceptable for New and Nonofficial Remedies. An article will not be acceptable if its name suggests to the laity the diseases or conditions in which it is said to be indicated.

After December 31, 1912, recognition will be refused also to names so framed as to indicate even to physicians the diseases or conditions for which the article is to be used. The Council will make no objection to articles submitted to it before December 31, 1912, on the ground that the name is suggestive to the physician, provided that the name is already in use at the time of submission and also provided that the name is so framed as not to be liable, in the judgment of the Council, to lead to self-medication on the part of the public.

Medicine, in common with other branches of knowledge, requires that the subjects with which it deals be provided with a rational, descriptive nomenclature. The Council holds it desirable and important not only that the medicaments official in the pharmacopœias should be provided with scientific names, but that those of a proprietary character should also have names which are descriptive of their composition. Further, the Council believes that the interests of both the manufacturer and the consumer, the physician and his patient, can be sufficiently safeguarded if to the descriptive name of an article there be appended a distinctive word, syllable, initial or sign that shall identify its manufacturer. In substantiation of this it may be stated that such designations have permitted manufacturers to build up almost world-wide reputations for their products. Reference need only be made to chloral hydrate, Schering; chloroform, Squibb; phenacetin, Bayer; quinin sulphate, P.W.R.; sodium salicylate, Merck, etc. In view of these considerations, the Council offers its endorsement and coöperation to any effective movement toward the establishment of a rational, and if possible, international system of the naming of medicaments.

However, the Council recognizes that trade conditions make difficult or infeasible, at this time, the adoption of such a rational system of nomenclature. But, on the other hand, experience has shown it possible to give names to new remedies which at least shall indicate their principal constituents. Thus among the articles described in "New and Nonofficial

Remedies" appear such names as arsenoferratin, an organic compound of iron and arsenic; Bornyval, a valeric acid ester of borneol; brovalol, a bornyl bromvalerate; carbosant, a carbonate of santalol; guaiacodein, a compound of codein and guaiacal; tannismuth, a tannate of bismuth. Therefore the Council recommends that all remedies be given names which shall at least be suggestive of their most characteristic or potent constituents. The Council gives the fullest recognition to the principle that a discoverer has the right to name his discovery and interposes no restriction in the naming of new substances, provided that such names shall not be detrimental to the progress of medicine and thereby work against the welfare and health of the people.

Names which are suggestive of the diseases or conditions in which the remedy is said to be indicated are objectionable because the layman becomes familiar with the names of such remedies and their uses through physicians' prescriptions and is thus led to use them in indiscriminate and harmful self-medication. The many cases of harmful self-medication with such remedies as migrainin, diabetin, purgen, antikamnia, antitussin, which preparations at first were exploited to medical men only, are sufficient to show that such names should be forbidden.

But even if the name of remedy does not disclose its proposed use to the laity, it is still objectionable if it suggests to the medical man the diseases or conditions in which the remedy is to be used. This for the reason that the thoughtless physician will base his use of the remedy on the name without giving due consideration to the condition and symptoms of the patient.

Recognizing that some therapeutically suggestive names have been applied without any intention of appealing to the laity thereby, and further recognizing the difficulty of changing a name once established, the Council has decided to make no objection to names that are now in use if they are therapeutically suggestive to physicians only. Such articles, if on the market and submitted prior to December 31, 1912, will be considered acceptable in so far as their names are concerned.

The following rules apply to the names of articles proposed for inclusion with New and Nonofficial Remedies:

1. The names of pharmaceutical preparations or mixtures must indicate the most potent ingredients.

2. Names which are in any way misleading will not be accepted.

3. Names which suggest diseases, pathologic conditions, or therapeutic conditions will not be admitted, except as provided under 4.

4. An exception is made for established names of synthetic substances, active principles, and other new substances: For these if submitted prior to December 31, 1912, therapeutically suggestive names may be admitted, provided that the name has been in

actual use prior to December 31, 1912, and provided further, that the name is not likely to foster self-medication by the laity.

W. A. Puckner, *Secretary.*

535 Dearborn Ave.
Chicago.

Report on Market Conditions for Messina Essences During the Fall and Winter Seasons 1911–1912.

We beg to submit herewith the usual Market Report of our parent house, Messrs. Schimmel & Co., for the information of our patrons with reference to the prevailing market conditions for the Messina Essences during the past season:

" Referring in detail to the different Messina Essences we find the following conditions:

Oil of Bergamot: We left this Oil in September of last year at an average market price of M. 42.— to M. 43.—per kilo. This price prevailed all through September and October, during which time the still existing stocks of oil were practically consumed to the last drop.

During the last four to six weeks before the arrival of the new oil the stocks were depleted to such an extent that some of the obstinate holders, who had refused to sell before, could realize for their oil prices up to M. 50.— and M. 52.— per kilo.

Though the conditions of the new crop did not appear very promising at all, the producers expected, nevertheless, that prices of M. 40.—to M. 41.— would yield a sufficient profit and, therefore, began around the middle of October to enter into the first transactions for future delivery of the new oil at these prices.

As soon as a price for the new oil was established, a big French concern entered the field and began to buy up all the new crop oil that was offered for future delivery and continued buying even at advancing prices until they had secured an amount of about 15,000 kilos.

The prices, which at the beginning of these operations ruled at about M. 41.—, were in this way driven up to M. 46.—per kilo, which quotation prevailed when the first lots of new crop oil appeared in reality on the market.

The ester content of Bergamot Oil depends, as is well known, upon the degree of ripeness of the fruit. Unripe fruits furnish an oil which contains between 28 and 32 per cent. of Linalylacetate; riper and completely ripened out fruits give oils whose ester content rises as high as 42 and even 44 per cent.

As the value of Bergamot Oil is measured by its ester content, it was in former years in the interest of the producers to have their fruit well ripened before pressing the oil. But the fact that no old oil was available in this season to bridge over the interim and the urgent demand of the buying element in the market induced the producers during this season to depart from this principle and fruit in more or less unripe condition was used for the hasty production of oil, the more so, as experience had taught the producers that such fruit, though yielding an oil of lower ester content, furnishes a larger amount of oil than fully ripe fruit.

If in former years, under more normal conditions, oils with a higher ester content enjoyed, as a matter of course, the preference over the poorer oils, there were during the season with its strained conditions plenty of buyers that were eager to take up even these deficient oils.

In consequence of this, there developed quite a lively market for Bergamot Oil in December of last year which brought about large transactions at prices of from M. 43.— to M. 48.— per kilo, and everything seemed to point to a further regular development of conditions until in the first days of January, 1912, a catastrophe happened which overthrew all previous estimations and anticipations instantly.

Cyclones of a violent character visited the coasts of Calabria on the 3rd and 4th of January to return again with unbroken force on the 6th and 7th of the same month. Through the vehemence of the storm practically all the fruits still hanging on the trees were beaten down and thousands of trees knocked down or rooted out. Only a few well-protected valleys escaped destruction by the enraged elements.

As is well known, the manufacture of Oil of Bergamot is a rather difficult and tedious process, which requires the use of special machinery. The enormous quantity of beaten off fruit covering the ground prevented, therefore, the utilization of a very considerable part of it in the short time which elapsed between their falling from the trees and the decay of the bruised fruit. This calamity was aggravated by the great difficulty to procure adequate manual help in these districts which are from year to year more and more depleted in population through the constant emigration to America. In this way many thousands of fruits were entirely lost for the production of oil and the yield from the more or less damaged fruits showed, besides, such a deficiency that not more than about one-half of the regular quantity of oil was obtained from them.

These storms had produced such a tremendous devastation in the fertile districts of Southern Italy that many of the fruit growers were nearly ruined and an enormous financial loss caused by this catastrophe. Another grave consequence of the storm was that whatever fruit was left hanging on the trees did not fully ripen any more, as it was evidently crippled somewhat, while the beaten off Bergamot fruit furnished only a very poor grade of oil. Under these conditions nearly one-half of the total crop had to be worked off in the month of January under the most adverse conditions, so that the loss in oil can be pretty accurately estimated at 30 to 40 per cent. of the amount previously counted upon.

It is evident that in this way the production was brought to an abrupt end, and the result of all these conditions may be summed up in stating that the entire crop did not amount to more than about 40 to 45 per cent. of an otherwise medium crop, and that the oil showed almost invariably a very low ester content.

High-grade oils of 37 to 38 per cent. ester have been produced only in very small quantities and are hard to obtain.

That the market, under these abnormal conditions, showed extraordinary fluctuations is only natural. The oil producers who did not obtain more than one-half of the quantity of oil, they had counted upon, and who, besides, had only oils at their disposal of a much lower degree than they had sold beforehand, found themselves in a two-fold calamity and many of them could simply not fulfill their obligations. The exporters in turn, who could not rely upon the deliveries of oil from the producers to cover their own sales for future delivery, had to enter the open market and buy whatever they could obtain to protect their own *découvert*. That this situation had to lead to a wild speculation and manipulation of the market is self-evident and the prices advanced in the course of a few weeks from a level of about M. 45. to M. 65. per kilo, much to the detriment of the export trade. It is no wonder that the producers tried to fructify this condition as much as possible and held to the high prices tenaciously in order to recover whatever they could from the losses they had previously sustained.

On the other hand, the consuming trade will naturally shrink from those exorbitant prices and incline more and more to the synthetic oils which are offered as substitutes for the natural oil.

During the last weeks the prices for the oil have slightly yielded as some of the producers have to realize upon their holdings, so that an average quotation to-day may be recorded at M. 50.— to M. 63.—, according to the ester content of the oil.

It may be mentioned here once more that the oil which was produced under such adverse and abnormal conditions shows, with few exceptions, a considerable deficiency in quality compared with oils from former crops. The odor is generally just as satisfactory as the ester content; the rotation, the specific gravity, all show anomalies. As nearly all of this year's oils are derived from more or less unripe fruit, we find aside from the deficient high angle of an abnormally low specific gravity an exceedingly high angle of rotation, which has been found in single oils to be as high as 22 to 23°.

Sweet Orange Oil: The new crop found the market entirely bare of old stocks and the arrival of the new oil was, therefore, the signal for quite a lively business which was further animated by the realization that the crop was only of small dimensions. The tendency was firm and upward from the start on and prices kept on M. 17.— to M. 18.— per kilo until, later on, some stocks had again accumulated. Then the market yielded slightly, which induced those familiar with the conditions in the producing districts to follow the receding market with their purchases until this reached the low-water mark around Christmas of last year. Since then the tendency has been slowly upward again until the price settled on about M. 18.— per kilo, as before.

The supplies of Sweet Orange Oil are pretty scarce, so that we will have, in all probability, to count with higher prices for the coming summer months.

Bitter Orange Oil: The prices of oil of last year's crop were about on a level with those of the oil of sweet oranges. Larger stocks could not be accumulated, and it is, therefore, very likely that higher prices will rule with the advancing season. All indications, by the way, point to the fact that the interest in this oil is gradually decreasing.

Oil of Mandarins: The new crop was not a bad one and can safely be compared with a good average crop. If, nevertheless, the price settled from the start on M. 43.— per kilo, a price which has been kept up nearly unchanged, this was due to the fact that neither in Italy nor abroad existed any stocks of old oil at all, so that the new oil found and is still finding a ready market all over.

Oil of Lemon: This important article has undergone several very considerable price fluctuations, during the last seven months. The last crop, as is well known, was barely of medium size, but for the reason that there were considerable stocks carried over from the previous season, there were at all times sufficient supplies to provide for the exigencies of the export trade.

These conditions developed a depressed market during the fall months of last year which affected the prices of oil for prompt as well as for future delivery. The exporters made strenuous efforts to induce their foreign correspondents to close contracts for future deliveries at constantly receding prices and the local holders tried to dispose of their prompt stocks likewise. The natural consequence was that from the beginning of September towards the end of October the prices for prompt oil gave way from M. 15.— to M. 12.— per kilo and for goods on future delivery from M. 11.— to M. 10.25. These developments in the original market made the foreign buyers rather reserved and cautious in their transactions, and it was not until it was generally realized that the exportations for the new crop had been quite considerably estimated that this downward movement came to a standstill. This caused quite a sharp reaction of the market and in a few days the price for future deliveries had again risen to M. 10.75 to M. 11.— per kilo, while for prompt oil M. 12.25 to M. 12.50 was paid.

Now, when the first actual delivery period approached in December of last year, the fact was disclosed that there existed quite a large uncovered short interest and that the actual amount of oil ready for delivery was entirely inadequate to compensate for the obligations entered into during the period of depression.

If in the preceding season of 1910–11 an amount of about 100,000 kilos of old crop oil was at the disposal of the export trade, all the available stocks of old oil obtainable in the season of 1911–12 did not amount to more than utmost 30,000 kilos, and this deficiency drove the prices up in the first half of January, 1912, to M. 11.50 per kilo.

In the first days of the second half of January the East and

North Coasts of Sicily were visited by heavy storms, which caused the trees to shed an enormous amount of fruit and otherwise damaged the fruit trees. The amount of fruits, so knocked down from the trees, was so large that most of them had to be used only for the manufacture of Citrate of Lime in order not to lose them entirely. This furnished another sharp impetus for an upward movement of the market, which advanced by leaps and bounds to M. 12.50 in the beginning of February, to rise in the first two weeks of February to M. 14.25, and to reach the high-mark of this season with M. 14.85 during the first days of March.

Lemon Oil had now settled again at the same level which it occupied in September of last year, and the upward movement would have, no doubt, continued, if the depressing influence of the big strikes in several centres of the world had not also affected the market for Messina Essences. So, following the general tendency of trade in the international markets, its upward course was halted and a slightly easier tendency has fixed the price at present on an average of M. 14.25 per kilo.

To arrive at certain conclusions in reference to the further development of the market for Lemon Oil is this year connected with exceptional difficulties.

According to statistical figures, the entire amount of Lemon Oil at the disposal of the world's consumption is this year by no means larger than last year. It must further be taken into consideration that the world's consumption last year did not only absorb the entire amount of last year's crop, but in addition an amount of about 70,000 kilos carried over from the preceding season.

The exportations during the last three months show an increase of 50,000 kilos over the figures for the corresponding period of last year. This shows that the 30,000 kilos of old oil left over from last season must have been consumed for these shipments together with the new oil, as the latter would not have been sufficient to make up the required amount. It has so far been impossible to accumulate any stocks of new oil in the shipping ports, and this after three-quarters of the new manufacturing season have elapsed! Besides this, all the producers and some of the export houses are in arrears with their deliveries.

In the district of Palermo the new crop has been more disappointing than in the other parts of Sicily, and the production of oil has practically not been started here at all. It seems that the growers in this district are satisfied to ship their fruit for the daily consumption of the larger Italian cities, which relieves them of all further trouble and yields evidently sufficient profit to prevent them from using the fruit for the production of oil.

A considerable reduction in the prices of the oil could only be caused by the accumulation of stocks in the hands of the producers, which according to the prevailing conditions appears very unlikely not only for the present, but also for the rest of the producing season. The foreign markets, on the other hand, do not seem to be fully covered for their yearly consumption, and it seems, therefore, that only a great war or similar factors could produce a depression of the market. As we hope that no international complications will interfere with the world's trade in the near future, we do not see any actual cause for a weaker market, while a strengthening of the tendency might be produced at any moment through a general improvement of the trade conditions in the international markets.

The present situation in the producing districts is such that it is near to impossible to make any predictions for the new crop. The southern parts of Italy have had a very mild winter with little rain and very little snow in the mountainous regions. These favorable weather conditions have produced an abundant foliage on all the various citrus trees, with the exception of Bergamot, which would point to a satisfactory flowering period, if the scantiness of the rainfalls during the winter and the already apparent dryness of the deeper soil might not interfere with the further sound development of the trees. Only the climatic conditions during the coming spring months will definitely show whether the hopes for a good crop will be realized, or the apprehensions for a dry summer and a scanty crop in consequence of it will be justified.

Another factor which might greatly influence the development of the new crop, and which deserves mentioning here, is the occurrence of a certain species of plant lice (Aphidae), the so-called Blood Louse, which during the last two years has affected extended districts, especially in the vicinity of the larger cities in Sicily and Calabria.

This parasite attacks the trees and slowly destroys the same. Especially prone to these attacks are the Mandarin, Bergamot and Lemon trees, while the sweet and bitter Orange trees seem to possess a greater power of resistance against this infection. Systematic experiments made by the Governmental Agricultural Institutions have resulted in the finding of certain methods for the destruction of these parasites, but their application, which consists in frequent sprinkling of the trees with antiseptic solutions, is not only difficult, but also increases the expenses for the cultivation of the trees considerably and does not vouchsafe the restoration to health of the affected trees. This new disease of the Citrus trees is a great danger for the entire Agrumen industry, and is likely to interfere heavily with the future production of Messina Essences in Sicily and Calabria.

Let us hope that science will soon find the right weapons to fight off this new plague to save us from a new grave peril for our industry."

FRITZSCHE BROTHERS.

NEW YORK, April, 1912.

OBITUARY.

CLEMMONS PARRISH.

As an American institution the family of Parrish is much older than the State of Pennsylvania itself. Settling first in Maryland, they came to Philadelphia almost with its founding, and have been actively identified, professionally and philanthropically, with its growth, ever since. Among the early members of the family, noted as physicians, educators, and philanthropists, one name stands out pre-eminently, Professor Edward Parrish. He was prominently connected with the Philadelphia College of Pharmacy as trustee, and later as Professor of Materia Medica and of practical pharmacy; he was a noted chemist and pharmacist, celebrated throughout the United States; he was a member of many pharmaceutical organizations; and contributed largely to the literature of pharmacy and medicine.

The second son of Professor Edward Parrish, Clemmons Parrish, was born August 1st, 1848. His early education was obtained in Friends' School, and he early showed a preference for scientific studies, giving promise of perpetuating his father's memory as a pharmacist. At the age of seventeen he graduated from the Philadelphia College of Pharmacy, and in 1869 joined the College, and was actively identified with the Alumni Association. He was engaged in the practice of his profession with his father, under the trade name of Edward Parrish and Son, at 8th and Arch Sts., which store was wèll known, and from which many of the great names in Pharmacy of to-day, received their first practical experience. Professor Parrish died in September, 1872, and shortly after that the store changed hands and Clemmons Parrish became identified with the manufacture of a sparkling drink, Zoedone, and moved with his family to Orange, New Jersey, and later to New York. In 1881 he purchased a drug store in Brooklyn, situated at Henry and Orange Sts., and practiced pharmacy there until his retirement from business in 1906. Mr. Parrish was of a retiring nature, and never associated himself prominently in a public way, but his business grew and he became well known for the quality and care with which he compounded prescriptions, and manufactured specialties and pharmaceuticals, so that physicians recommended their patients to him, and his trade included the most prominent families in the city. He always attended to his duties personally, and could be found in his store at any hour of the day. He had many clerks who have profited by his teachings, and he also prepared many young men in practical pharmacy who are prominent as druggists and manufacturers, and acknowledge their indebtedness to him for early training. He was of the old school of druggists, and never could adapt himself to the newer methods of business. Drugs and pharmaceuticals could always be found in his store, and those sundries required in sickness, but he was loath to add the hundred and one accessories to be found in the modern pharmacy, and filled his shelves with specialties of his own manufacture, and with preparations of a proprietary character as they might be demanded by physicians.

He was very charitably inclined, and would never refuse a request to help the sick. His advice was sought very often during the day, and the poor of his neighborhood looked upon him as their best friend. The store at Henry and Orange Sts. became a landmark in the city, and still bears the name of "The Parrish Pharmacy." The success of the business in that locality will always depend largely upon the name of Parrish.

After Mr. Parrish's retirement, he lived with his son, Dr. Edward Parrish, for several years, and two years ago removed to

Philadelphia again, to the city of his birth, to pass his remaining years. On March 28th he was stricken with pneumonia, from which he died three days later in the Garrettson Hospital, at the age of 63 years and 7 months. He leaves a widow, Emma Powell Parrish, residing at 1704 Race St., and two sons, Edward Parrish, a physician in Brooklyn, N. Y., and Henry C. Parrish, a clerk in the firm of C. C. Miller & Co., of Philadelphia, and residing at Riverton, N. J.

Mr. Parrish was a member of the Religious Society of Friends, a kindly, gentle, upright man, of sterling integrity, and worth, mourned by all who knew him, and valued as a sincere friend. His interment was in Friends' Cemetery, in Prospect Park, Brooklyn.

BROOKLYN, N. Y. EDWARD PARRISH, M.D.

PHILADELPHIA COLLEGE OF PHARMACY.

ANNUAL MEETING.

The annual meeting of the College was held March 25th, 1912, at 4 P.M., in the Library, the President, Howard B. French, in the Chair. Twenty members were present. The minutes of the quarterly meeting held December 26th, 1911, were read and approved. The Minutes of the Board of Trustees for the meetings held December 5th, 1911, January 2d, and February 6th, 1912, were read by the Registrar, J. S. Beetem and approved.

President's Address: President French read his Annual Report which was ordered entered on the minutes. The following items of information are abstracted from the Report:

Material repairs and improvements were made to the heating and lighting plant, and they have shown more than the usual satisfactory results during the strain which was placed upon them owing to the extremely severe winter weather: during a portion of the time it was necessary to run the heating plant all night to keep the buildings comfortable when the temperature was hovering around zero.

The Chemical Laboratory was repainted. The Chemical Lecture Room had some repairs made to the ceiling, and the ceiling and walls repainted. The Reading Room was thoroughly overhauled and repainted as were also the vestibules, hall, and corridor. The seats in the lecture rooms have had placed upon them black and white enameled iron numbers, the better to register the attendance of the students at the lectures, in pursuance of the plan of the Pharmacy Board. Reflex gas burners were placed in vestibules, hall landings and library and besides their utility have relieved the dynamos of the extra load they were compelled to carry before these lights were put in.

The Gymnasium was established last year in the expectation that it would prove of material advantage to the students attending the College, but lack of care and reckless use of it by the students has caused considerable annoyance to those in charge, and would urge, that in future the Gymnasium be not opened unless someone in authority is in charge to maintain supervision of the room. A portion of the basement formerly used as a gymnasium has been partitioned off and twenty-five steel lockers placed therein for the use of the students. This seems ample for the present requirements of the class. The College property as a whole is in a fairly good condition, but in the near future it will be necessary to do painting on the exterior of the building.

There is a total attendance of 489 students, including those students taking special courses in the various departments. It will be of interest to note that all graduates from the special courses in chemistry have had no difficulty in securing lucrative positions—in fact more requests are made for these men than can be supplied by the College, and there is constantly on file a list of applications for them.

During the year a new electrical slide and opaque projection lantern, the gift of William E. Weiss, of Wheeling, West Virginia, a member of the class of 1896, was installed in the Chemical Lecture Room and has proven of material benefit.

In the Department of Materia Medica the increasing importance of treating diseases by means of serums, bacterial vaccines, etc., has been recognized and increased attention has been given to the subject. The physiological assay of drugs has also been brought prominently to the attention of the third year class, and for the first time in the history of the College the subject has been demonstrated upon living animals. The requirements of the Conference of Pharmaceutical faculties that six hundred hours should be devoted to laboratory work has led to important extensions in the work of the Department of Operative Pharmacy.

It is interesting to know that during the past summer a Professor of Pharmacognosy in one of the Western Universities spent much time in studying the methods and technic in use in the College. The greenhouse and roof garden has been used to a greater extent for experimental purposes than ever before. The Professor in charge hopes in the near future to suggest the establishment of a special course in plant physiology. During the past year a number of native medicinal plants were sent to Professor J. W. Moll, of Gronigen, Holland, who, in acknowledgment of this courtesy, has sent a number of lantern slides, which will be of use in demonstrating the lectures.

The course in Commercial Training is being developed with very satisfactory results, attendance is good and the interest unabated. Lectures by business men, mostly graduates of the College, of an hour's duration, have added value to the course. This course is unique in Colleges of Pharmacy, and this College was the first to take up this subject, and examinations held which have an equal rating with the other branches.

The act creating a Bureau of Professional Education became effective July, 1911. The law requires that all first year students must have entrance qualifications equal to at least one year high school instruction.

During the year one member has been elected, one resigned, and three have died, namely, Thomas M. Newbold, April 2d, 1911. Joined the College in 1872. Wallace Procter, May 27th, 1911. Joined the College in 1874. George R. Vernon, September 16th, 1911. Joined the College in 1872. In the death of Wallace Procter the College lost a most active member. For many years he served on the Board of Trustees.

During the past year a very active effort was made to secure ground upon the Parkway for the use of the College in erecting new buildings suitable for the growing needs of the institution. The ordinances necessary for this purpose passed both Select and Common Councils and were approved before Mayor Reyburn went out of office. The necessary petition required to further this object was filed in the Court of Quarter Sessions, but other obstacles have arisen and the matter is resting in abeyance. Your President, however, feels that with the great good your institution is doing, and its liberality towards the educational resources of the city in giving to the Board of Education six scholarships each year, or having in course eighteen scholarships per year, some recognition must necessarily be given by the city authorities to the College.

In closing, your President has pleasure in acknowledging the honor which was extended to him by the Alumni in presenting to the College on April 4th, 1911, a large oil portrait of himself, painted by Hugh H. Breckenridge, one of the most prominent artists of the city. He also expresses his appreciation of the active co-operation of his fellow officers and the faculty during the past year.

Committee on Nominations: The report of the Committee on Nominations was read, and ordered entered and filed.

Report of Committee on Pharmaceutical Meetings: The meetings have been held regularly and were presided over by different members of the College. Papers or addresses were presented by C. B. Lowe, George M. Beringer, M. D. Allen, C. Mahlon Kline, Otto Raubenheimer, H. M. Seckler, M. Becker, J. Percy Remington, E. F. Cook, E. H. Sparks, A. W. Miller and John K. Thum. The general discussions were participated in by very many of the members. Specimens and apparatus were presented by Dr. W. H. Nagai of Japan, President French, Parke, Davis and Co., Professor Sadtler, J. W. England and Charles Emig.

With the change in the By-Laws, leaving the date open for the holding of the meetings, they have been held on either Mondays or Fridays, which seemed to suit the convenience of the students. They have been quite well attended, and in a few instances largely so. The meeting devoted to Sunday closing and shorter hours was particularly well attended, and a number of the students participated in the discussion. In planning for the meetings next year a Recorder will be selected who will give special attention to the meetings and arrange the details of the program.

Committee of Publication: The AMERICAN JOURNAL OF PHARMACY has been published regularly during the past twelve months. The financial statement shows that the receipts for the past year were larger than the previous year but the cost of printing and electrotyping were higher. The May, 1911, number was devoted largely to college matters of both general and special interest, making it necessary to print an unusually large number for that month. A number of analytical and scientific papers were also published which were expensive in composition. The usual appropriation to cover the cost of JOURNALS furnished to members and exchanges was made.

Editor's Report: During the past year there have been published 579 pages, exclusive of index, making an average of 48½ pages to an issue. This matter included 62 original and selected papers, viz.: 8 on chemical subjects, 13 on assaying, 10 on pharmaceutical subjects, 6 on pharmacopœia, 4 pharmacognostical investigations, 5 biological standardization, 2 technical subjects, 3 legislative and educational, 3 biographical, and 3 miscellaneous. Also the quarterly review on Progress in Pharmacy and 37 book reviews, Reports of the Meetings of the College, Board of Trustees, the various National and State Pharmaceutical Associations, collateral organizations, special lectures, personal and obituary notices, abstracts and miscellaneous items have also been fully reported. Attention may be called to some of the special features of the volume for the year just ended: The Quarterly Review of the Progress of Pharmacy, by Mr. Wilbert, is very helpful to pharmacists in keeping them posted as to the general trend of pharmaceutical activity, but also in keeping them informed on the properties of medicinal substances, as also on the newer views regarding the properties of well known substances. Dr. Frederick B. Power and his associates, of the Wellcome Chemical Research Laboratories, continue to send papers giving the results of their investigations. Several papers have been furnished by the workers in the Public Health and Marine Hospital Service. Dr. Taylor contributed an interesting paper on European requirements to enter pharmacy, to be followed by other papers on pharmaceutical education. The second paper by Mr. Reinick on insects destructive to books has been widely reprinted and abstracted. The paper by George M. Beringer, Jr., on the Extemporaneous Preparation of Medicated Gauzes has been of considerable interest to the pharmacist, as also the paper on Petrox Preparations.

That the AMERICAN JOURNAL OF PHARMACY is a veritable mine of pharmaceutical knowledge will impress itself on any one who takes the pains to examine its eighty-three volumes. And one is surprised no less at the quality than at the variety of the articles presented, one sees that this vast storehouse of information is not a sudden growth, but rather the result of slow and painstaking effort of most of the best minds that have contributed to the advancement of pharmacy. A pharmaceutical calendar from the pages of the JOURNAL could easily be made for the use of our members for the 365 days in the year. In connection with the papers and discussions which we have had this year on the subject of "Sunday Closing and Shorter Hours," read at one of our pharmaceutical meetings, it is rather interesting to note that already in 1860 (Vol. 32, pages 473, 491 and 574) the Apothecaries of Philadelphia met at this College and practically settled the whole question of Sunday closing. This probably shows how in the evolution of any specific subject we as individuals seem to move in a circle. Every great fundamental subject relating to pharmacy we will find has been considered at some time in the pages of the JOURNAL, nearly every so-called "live subject" will be found to have been treated in its pages as "Apprentices and Early Training," "Relations of Physicians to Pharmacists," "Pharmacists as Analysts and Food inspectors," "Sterilizing Hypodermic Solutions," "Influence of Cultivation and Soil on Plants," etc. It will surprise some of our members to know that our predecessors devoted careful attention to the same problems that confront us, and solved them in much the same way that we are doing to-day. It emphasizes the fact that it is not so much a lack of knowledge of how to do things that is at the bottom of our difficulties, but in applying our knowledge in practice. This not only applies to the subjects enumerated but also with regard to our knowledge of drugs and preparations. A perusal of previous volumes will show that the task which we are trying to solve has been already thrashed out, and the experiences of others, if published, are well worthy of our consideration. That this is a point of view shared by others is shown by the increasing number of inquiries received for completing partial sets of the JOURNAL by individuals and educational institutions.

Curator's Report: The collections in the museum are growing in number and value. During the year some notable additions were made, among which were Chinese and Japanese drugs, photographs in colors of medicinal plants and historical donations. The great need of the museum is more shelf room for the display of specimens, this is especially true of the historical collection, which can be made of much popular interest, if properly displayed. Not only this, but a historical display in evidence suggests the donation of other historical objects.

The historical matter now on hand is large and most valuable and growing more so each year.

Librarian's Report: There have been added during the year by gift 101 volumes, by purchase 47 volumes. Up to this time

2872 books are ready for cataloguing; 40 volumes of periodicals and 5 volumes of theses were bound and 41 volumes of 1911 periodicals are ready for the bindery. The Government continues to send, Census, Treasury and Librarian Reports, Public Health, Commission of Labor Reports, and Bulletins and Circulars from the Department of Agriculture. American, English, and German journals are subscribed for. Other journals and periodicals are received in exchange. 829 persons consulted the library during the past year.

The President made the following appointments:

Delegates to the New Jersey Pharmaceutical Association: George M. Beringer, Henry Kraemer, C. B. Lowe, H. L. Stiles, H. P. Thorn.

Delegates to the Pennsylvania Pharmaceutical Association: C. B. Lowe, Joseph P. Remington, F. P. Stroup, William McIntyre, William E. Lee, E. M. Boring, Charles H. LaWall.

Committee on By-Laws: George M. Beringer, J. W. England, C. A. Weidemann.

Election of Officers, Trustees and Committees. The list of Nominees was read, when Mr. Rumsey moved, as there was no contest, that the secretary be directed to cast an affirmative ballot for the nominees, this being agreed to, the Secretary cast the ballot when the President announced the election of, President, Howard B. French; First Vice-president, Dr. Richard V. Mattison; Second Vice-president, Joseph L. Lemberger; Treasurer, Richard M. Shoemaker; Corresponding Secretary, Dr. A. W. Miller; Recording Secretary, Dr. C. A. Weidemann; Curator, Joseph W. England; Editor, Henry Kraemer; Librarian, Katharine E. Nagle.

Trustees for Three Years: Walter A. Rumsey, Jacob M. Baer, Warren H. Poley.

Committee on Publication: Samuel P. Sadtler, Henry Kraemer, Joseph W. England, Joseph P. Remington, Martin I. Wilbert, Miss Florence Yaple, Charles H. LaWall.

Committee on Pharmaceutical Meetings: Henry Kraemer, Joseph P. Remington, C. B. Lowe, William McIntyre, George B. Weidemann.

Professor Henry Kraemer moved that the members extend their felicitations to Professor Joseph P. Remington on his 65th birthday (March 26th) and the completion of 40 years as a member of the faculty, and stated that such a record was deserving of our congratulations. Professor C. B. Lowe seconded the motion, which was adopted. The President announced the result to Professor Remington and expressed the hope of his continuance in the work of the College for many years to come. Professor Remington responded in a feeling manner and expressed the pleasure it gave him to receive these felicitations from his fellow members.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

December 5th, 1911.—Seventeen members were present.

Committee on Property reported that the electrical work necessary to install the lantern in the Chemical Lecture Room was completed.

Committee on Library reported a number of new books had been purchased; that the total number of books ready for cataloguing was 2088. A large number of persons used the Library during the month.

Committee on Instruction reported that the record of attendance of students at lectures is being kept in accordance with the new regulations, with satisfactory results.

The Board of Education appointed Mr. David Jackson examiner of pharmacy students.

A sub-committee was appointed to prepare an outline of studies equivalent to one year's attendance in a high school; same to be printed in pamphlet form and sent to prospective students.

Committee on Examination reported that Miss Asse Teisen had complied with all the requirements of the College and was entitled to receive the Certificate of Proficiency in Chemistry, and same was granted.

Committee on Announcement reported concerning the financial matters connected with the Bulletin. The expenses of the year were larger than the previous year, owing to the edition of over 40,000 copies of the May issue. The Bulletin goes regularly to over 3000 of the Alumni, by whom it is much appreciated. An Honorarium was voted to Prof. F. P. Stroup and George H. Benkert for valuable services connected with the Bulletin.

A communication was received from Joseph Huntington of the Class 1898, asking for a duplicate of the Robinson Gold medal, the original having been lost. The application will be granted upon the submission by affidavit of satisfactory proof of the loss.

January 2d, 1912.—Thirteen members were present.

Committee on Library reported that a number of books had been added by purchase, and that 2200 books were ready for cataloguing. A number of persons used the Library during the month.

Mr. England referred to the use of Alcohol by institutions, and read a communication from the Commissioner of Internal Revenue, also his reply. Mr. England stated that if the decision of the Commissioner is maintained, it would mean an increased cost to the College of several hundred dollars a year for Alcohol. The Dean stated that the abuse by some institutions of the privilege of obtaining tax-free Alcohol had led to the decision.

Committee on Examination presented the names of five candidates for the degree of Master in Pharmacy; action was deferred until the Special Committee to whom the names were submitted, made a report.

Committee on Announcement reported the issuing of the December Bulletin as the holiday number.

February 6th, 1912.—Seventeen members were present.

Committee on Library reported that some additions had been made by gift and purchase. An increased number of persons consulted the Library.

Mr. England read a communication from Internal Revenue Collector McCoach stating under what conditions the College could use tax-free Alcohol.

Mr. Osterlund reported having received from Mrs. William B. Thompson, a number of books for presentation to the College.

Committee on Property reported that the insurance agents advised some changes in present policies, which have made quite a saving.

Committee on Instruction. The sub-committee on preliminary education presented their report, also a report from the whole committee. Much detailed information was given, and the various recommendations were separately acted upon and agreed to, with the exception of one recommendation, action upon which was deferred for one month.

The Committee to whom was referred the names of the candidates for the honorary degree of Master in Pharmacy reported favorably, when a ballot was taken and they were unanimously elected. The degree will be conferred at the coming Commencement.

THE AMERICAN
JOURNAL OF PHARMACY

JUNE, 1912

SEASONAL VARIATIONS IN THE RESISTANCE OF GUINEA PIGS TO POISONING.

By C. C. Haskell, A.B., M.D.

The studies of Hunt[1] in the variations of the susceptibility of animals to poisoning by acetonitrile according to season and diet gave results which are suggestive in several fields. Not the least important of these is the matter of standardization of remedial agents.

It has long been assumed that guinea pigs were especially suitable for the standardization of diphtheria antitoxin. Probably on this account, Reed and Vanderkleed[2] suggested their employment in the attempt to standardize the drugs of the digitalis group. These authors recognized the fact that the commonly-used frog varied much in its susceptibility to digitalis poisoning, and they hoped to avoid the trouble and doubt necessitated by the employment of some standard preparation, by which means it is hoped that the variations in susceptibility can be rendered unimportant.

To use guinea pigs in such a way, however, makes it necessary to assume that the resistance of these animals to digitalis poisoning is always practically the same, regardless of age, weight, sex, diet, or season. Vanderkleed[5] has shown that age, weight and sex do not influence the susceptibility, and in this we agree. Fully as important, however, are the factors of diet and season. From our earlier work[4] it was evident that diet did influence the resistance of the animals markedly, those on green food requiring a larger dose of the poison than those fed almost exclusively on dry oats. It is not probable that guinea pigs will ever be fed on exclusive green food diet when they are kept for commercial standardization, so our experiments represent an exaggeration of conditions apt to exist. Nevertheless, the variation brought out in so short a time is very suggestive, and seems to indicate the danger of relying upon the animals without the use of a standard drug.

From a continuation of the work which I undertook with Mr. Walters last August,[4] it seems that season also plays a most important role in affecting the resistance of guinea pigs to poisoning by ouabain.

On July 24, 1911, a stock solution of 1/10 per cent. ouabain in 70 per cent. alcohol was made up, and this solution has been employed throughout. As the dose necessary to cause the death of guinea pigs increased, the question arose as to whether this solution had deteriorated. To answer this, seven control solutions were made at various times by three separate individuals from three lots of Merck's ouabain and the strength of all eight solutions showed no differences in strength that I could detect. It would seem, contrary to what is commonly believed, that ouabain in alcohol is quite stable. Nevertheless, it was deemed safer to await a decrease in the resistance of the animals before reporting the results. The stock solution was diluted 1 to 10000 ouabain in 25 per cent. alcohol just before injection. The Hitchens syringe was used throughout and the attempt was to place the drug just under the skin of the abdomen. The animals were observed over a period of 24 hours, any living at the end of that period were considered as having survived the dose.

The lethal dose was determined for the eight months from August, 1911, to March, 1912, inclusive. Owing to the difficulty of securing animals in sufficient numbers, the determination of the lethal dose was not always made on the same date of each month. The animals were kept under similar conditions on a diet of oats, clover hay, and cabbage.

The following tables give the results secured:

DOSE IN GRAM PER GRAM GUINEA PIG.

Month	Survived	Died	Minimum Lethal Dose
August	.0000020	.0000026	.0000028 to .0000030
	.0000023	.0000027	
	.0000024	.0000027	
	.0000025	.0000028	
	.0000025	.0000028	
	.0000025	.0000028	
	.0000025	.0000029	
	.0000026	.0000029	

Month	Survived	Died	Minimum Lethal Dose
August	.0000027	.0000029	.0000028 to .0000030
	.0000027	.0000029	
	.0000027	.0000029	
	.0000027	.0000030	
	.0000028	.0000030	
	.0000028	.0000030	
	.0000028	.0000030	
	.0000028	.0000030	
	.0000029	.0000031	
	.0000029	.0000033	
	.0000029	.0000035	
	.0000029	.0000035	
	.0000030	.00000375	
	.0000030		

DOSE IN GRAM PER GRAM GUINEA PIG.

Month	Survived	Died	Minimum Lethal Dose
September	.0000022	.0000028	.0000030
	.0000022	.0000029	
	.0000024	.0000029	
	.0000026	.0000029	
	.0000028	.0000029	
	.0000028	.0000029	
	.0000028	.0000029	
	.0000028	.0000029	
	.0000028	.0000029	
	.0000028	.0000030	
	.0000028	.0000030	
	.0000029	.0000030	
	.0000029	.0000030	
	.0000029	.0000032	

DOSE IN GRAM PER GRAM GUINEA PIG.

Month	Survived	Died	Minimum Lethal Dose
October	.0000028	.0000036	.0000036
	.0000029	.0000036	
	.0000030		
	.0000030		
	.0000031		
	.0000031		
	.0000031		
	.0000031		
	.0000032		
	.0000032		
	.0000032		
	.0000032		
	.0000032		
	.0000033		
	.0000033		
	.0000034		
	.0000034		
	.0000034		
	.0000034		
	.0000035		
	.0000035		

Dose in Gram Per Gram Guinea Pig.

Month	Survived	Died	Minimum Lethal Dose
November	.00000036	.00000036	
	.00000036	.00000045	
	.00000036	.00000046	
	.00000036	.00000046	
	.00000038	.00000048	
	.00000038	.00000050	
	.00000038	.00000050	
	.00000038	.00000050	.00000052
	.00000038	.00000051	
	.00000040	.00000052	
	.00000040		
	.00000040		
	.00000045		
	.00000046		
	.00000046		
	.00000046		
	.00000046		
	.00000046		
	.00000050		
	.00000050		
	.00000050		
	.00000050		
	.00000050		
	.00000050		
	.00000050		
	.00000050		

Dose in Gram Per Gram Guinea Pig.

Month	Survived	Died	Minimum Lethal Dose
December	.00000048	.00000049	.00000052
	.00000048	.00000052	
	.00000049		

Dose in Gram Per Gram Guinea Pig.

Month	Survived	Died	Minimum Lethal Dose
January	.00000045	.00000052	.00000052+
	.00000045	.00000052	
	.00000050	.00000052	
	.00000050		
	.00000050		
	.00000052		
	.00000052		

Dose in Gram Per Gram Guinea Pig.

Month	Survived	Died	Minimum Lethal Dose
February	.00000025	.00000035	.00000035
	.00000030	.00000040	to
	.00000030	.00000040	.00000040
	.00000030	.00000040	
	.00000030	.00000050	
	.00000035		
	.00000035		

DOSE IN GRAM PER GRAM GUINEA PIG.

Month	Survived	Died	Minimum Lethal Dose
March	.00000030	.00000030	.00000036
	.00000030	.00000030	
	.00000033	.00000030	
	.00000033	.00000033	
	.00000033	.00000036	
	.00000036	.00000036	

From an examination of these tables, it is evident that in assaying a preparation of the digitalis group upon guinea pigs a standard preparation is as necessary as is the case with frogs. Furthermore, it would also appear that the individual variation of guinea pigs is by no means inconsiderable. The utmost care was used in giving the injections, and when there was any suspicion that the needle had penetrated muscle, that animal was discarded. The variation due to individual peculiarities is shown well in the November series and is also apparent in the March. In the first five pigs injected during this latter month, three succumbed to a dose of .00000030 gm. per gm. body weight. From this, it might be inferred, that the lethal dose was near .00000030 gm., but when the dose was increased to .00000033 gm., one pig succumbed and three survived. The animals all seemed sound and had been kept under precisely similar conditions.

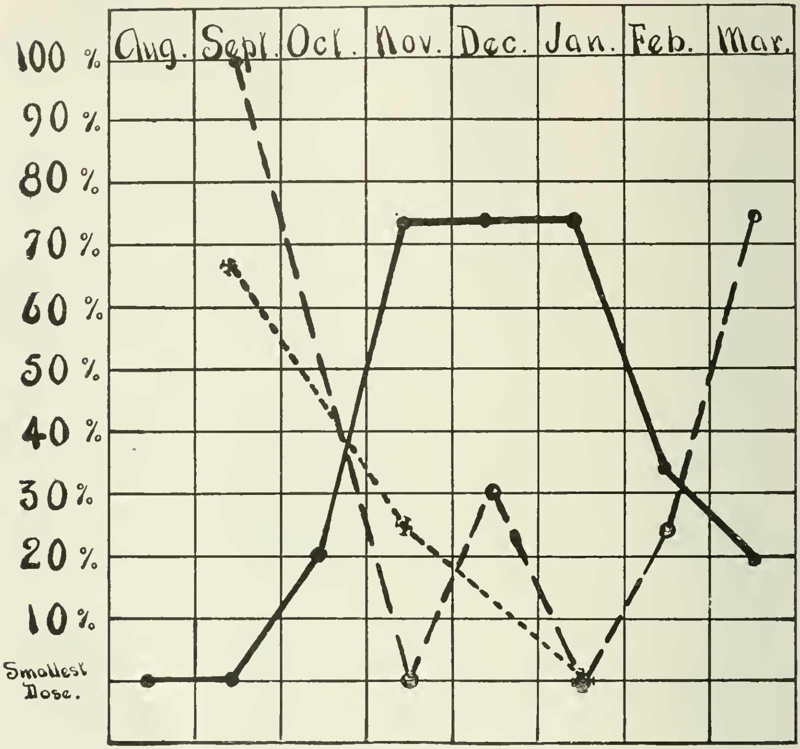
It is of interest to compare the seasonal variations of guinea pigs to poisoning by various agents. This comparison is better appreciated from an examination of Chart I.

Chart I shows the seasonal variations of guinea pigs to poisoning by acetonitrile, diphtheria toxin, and ouabain. The circles connected by interrupted lines represent the variation to acetonitrile according to Hunt.[1] The crosses and dotted lines, Südmersen and Glenny's [3] doses of diphtheria toxin. The points and solid lines, the doses of ouabain.

While the curve for the lethal dose of acetonitrile and diphtheria toxin show fairly close agreement, the largest dose of each being required in September and the smallest dose in January; the curve of ouabain is widely different.

This suggests the question, do all the members of the digitalis group show the same curve? This is of the utmost importance, because upon such agreement depends the value of a standard. It is to be hoped that the wide difference between the pharmacology of the bodies charted is sufficient to account for the divergent curves.

while the members of the digitalis group, being so closely allied, will show no such variation.



BIBLIOGRAPHY.

[1] Hunt, Reid: "The effects of a restricted diet and of various diets upon the resistance of animals to certain poisons." Bull, 69, Hyg. Lab., U.S.P.H. and M.H. Service.

[2] Reed, E. D. and Vanderkleed, C. E.: "The standardization of preparations of digitalis by physiological and chemical means." AM. JOUR. OF PHARM., March, 1908.

[3] Sudmersen and Glenny: "Variations in susceptibility of guinea pigs to diphtheria toxin." *Journal of Hygiene*, Vol. 9, No. 14, p. 399.

[4] Walter, A. L. and Haskell, Chas. C.: "Variations in the susceptibility of guinea pigs to poisoning by Ouabain." Read in Section on Scientific Papers, American Pharm. Assoc'n, Boston, Aug., 1911.

[5] Vanderleed, C. E.: "Variations in the Susceptibility of the guinea pig to the heart tonic group." AM. JOUR. OF PHARMACY, January, 1912.

From Pharmacological Laboratory.
ELI LILLY & COMPANY.

HOW FAR VARIATIONS IN FROGS CAN BE OBVIATED BY THE USE OF OUABAIN.

By W. F. Baker, B.S., M.D., Indianapolis, Ind.

It is well recognized that uniformity in strength of remedial agents is one of the most important factors in scientific medicine. It is equally well recognized that one of the most important groups in the whole materia medica, viz., digitalis and its allies, varies widely, 1 to 400 per cent., according to some investigators, not only in the crude drug and galenical preparations but in some of the so-called pure principles. For the above reasons a vast amount of work has been done in the endeavor to perfect a method by which these important agents may be assayed and standardized.

Most of the drugs which contain alkaloids and some of those which contain a single physiologically active glucoside can be assayed and standardized very readily by chemical methods. In the case of digitalis the activity of the drug is not represented by one but by several active principles, all of which cannot as yet be accurately assayed by chemical methods as demonstrated by Barger and Shaw.[1] Until it can be shown that these active principles are present in a definite ratio it appears very irrational to assume that such preparations can be standardized on the basis of a single active principle as advocated by some, since the activity of the drug is represented by the sum total of activity of these principles.

Physiological testing had been used for years in a qualitative way, but it remained for Houghton [15] in 1898 to propose it for the production of uniform preparations. After experimenting with various animals he decided upon frogs as being the most suitable for the purpose and while the frog continued to be the favorite animal the method as proposed by Houghton has undergone several modifications.

Two other type methods with their various modifications have been proposed and adopted by some for assay of the heart tonic preparations.

The blood pressure method while a good qualitative test cannot be used with any degree of accuracy to standardize the digitalis series owing to the slowness with which the effects of the initial dose disappears. The lethal dose method on the guinea pig, as originated by Laborde [17] and so warmly advocated by Reed and Vanderkleed,[20] is open to the objection that other constituents than those desired may be present and produce death. A preparation containing considerable decomposition products would appear to be an acceptable preparation while it would in fact be a very dangerous one. Another objection, as pointed by Edmunds and Hale [8] and also by Nestor, the cause of death in the case of mammals is not due in every case to the action upon the heart but upon the medulla, and for these reasons they think that methods which employ as a standard the minimum lethal dose obtained upon higher animals are not applicable to the physiological assay of the digitalis series. Hatcher's modification of the lethal dose method is undesirable for like reason, for its difficult technic, and lack of uniformity of results as demonstrated by Eckler.[6]

Logically the most desirable method is that one in which the end point will be exerted upon that tissue or organ upon which its therapeutic effect is desired, which shall be as free as possible from technical difficulties, and can be carried out at a moderate cost.

The frog method fulfills all these desirable qualifications. Dixon has pointed out that the principal difference in action on man and lower animals is the difference in action of those drugs which act upon the central nervous system. Agents which act upon one tissue or organ will act in like manner upon this same tissue or organ in any other animal.

The frog method as proposed by Houghton is essentially a lethal dose method and is open to the objection of all lethal dose methods. Another objection to this method is that twelve hours cannot be gotten into a working day. I have not infrequently found that frogs which had received the M.F.D. of digitalis for the one-hour method were active at the end of the twenty-four hours, but when opened it was found that the heart had stopped in systole.

Barger and Shaw,[1] Famulener and Lyons,[10] Edmunds and Hale [8] and others have compared the results of the frog heart method of assay with the results obtained by chemical assay and find the results more reliable and consistent by the physiological methods.

Moskowitsch's [18] results led him to believe that the physiological method while not necessarily useless is very unreliable. Focke [11] concludes from his results by observing proper test conditions and using a standard the method is very valuable and reliable.

Notwithstanding the points of superiority of the frog heart method for the assay and standardization of the heart tonic group the Committee on Physiological Assay of the Philadelphia Branch of the Am. Ph. Assoc. report [21] they are inclined to prefer the test upon the guinea pig, although they admit that the work of Edmunds and Hale[8] gives more accurate results, showing in no case an error of more than 10 per cent. They state there are two serious objections to the frog method as an official process of assay, viz., the factor of the time limit and what appears to them an almost unsurmountable objection, the great variation in the susceptibility of frogs due to difference in species, season, temperature, locality and the limited range of certain species. The only method, the report continues, of overcoming these obstacles would seem to be by comparing the preparations tested with a standard. "We are convinced," they say, "that such a method of standardizing is undesirable for pharmacopœial purposes because it would necessitate a distribution either by the Government or the Pharmacopœial Convention of a standard." "Guinea pigs," they say, "are obtainable in all parts of the world, and temperature, food, season, weight and sex do not influence their reaction." Experiments in this laboratory, however, have clearly demonstrated that guinea pigs do vary in their susceptibility almost as much as frogs and for this reason require a standard the same as frogs. In this laboratory we have found it impossible to the present time to secure enough guinea pigs to do our routine work, and from the reports which have come to us from time to time I believe that others are having the same difficulty.

It was with the view to clearing up some of these points on the variation in the susceptibility of frogs that I have undertaken a review of the literature and carried out a series of experiments to determine the influence of some of these factors.

Dixon[5] says that frogs do not vary as much as 50 per cent. during the year, being the most vigorous in the summer, least in spring. Famulener and Lyons[9] say, "We may be sure they will show far less variability than warm-blooded animals, and out of a dozen seemingly healthy frogs not more than one or two will show a variation of as much as 10 per cent. below or above the average susceptibility."

Hale[12] says the frog method gives all that any assay method can give and by using a digitalis preparation of known activity and keeping quality, crystalline digitoxin or ouabain proposed, accurate results may be obtained without reference to season, age, sex, temperature or species of frog used. He further pointed out that the unknown factors of absorption, elimination and individual susceptibility will persist in all attempts on assaying members of digitalis series. These, however, may be eliminated by using a large number of animals, discarding those which give too widely diverging results and taking the average of a number of concordant results.

Other factors of equal importance, such as age, size, sex, season, temperature, etc., can be eliminated or controlled when once their import is known. All recognize the necessity of using healthy frogs, and as Hale remarks, it is not difficult to obtain and keep them so.

Nearly all investigators have expressed the desirability of using a certain species of frogs, but Prevost,[9] Focke,[11] and Vanderkleed[22] appear to be the only ones who have carried out any investigation to determine just what influence species might have on the susceptibility and their results show considerable difference in the susceptibility of the different species but for the same species the susceptibility was fairly constant. This factor, however, is one easily controlled; Houghton says any species may be used provided all preparations of one assay are tested on the same species.

Buhrer[2] appears to be the first to make any mention of the influence of sex and employs females exclusively; Vanderkleed[22] claims as a result of his experiments females are 19 per cent. more resistant than males of same species and from the same locality. Barger and Shaw,[1] Dixon[5] and Ziegenbein[23] used only males while Focke[11] and Edmunds and Hale[8] believe sex plays a very inferior part. This accords with my own experience unless the females contain a large egg mass when they appeared to be slightly more resistant. To avoid any influence sex might have, I use the females for making preliminary tests and determine the end point on male frogs.

The early investigators disregarded the factor of weight, or, if they selected frogs of about equal weight, did not consider it in their calculations. Houghton advises using frogs varying not more than three grams in weight. Ziegenbein[23] used frogs weighing about 25 grams, but did not think a few grams made any difference. Focke[11] uses frogs weighing 20–30 grams and considers the weighing important. Moskowitsch[18] takes but little account of weight in calculating his results and this may account for the great variations in his results. Prevost[19] at first disregarded weight, but later weighed his frogs. He believed large frogs less sensitive than smaller ones, still he believed that *volume* of less import for digitalis than for aconite.

As to the effect of age or the length of time in captivity workers differ: Bührer's[2] experience led him to believe they varied considerably in two weeks' time to one and the same drug. Ziegnbein[23] used only freshly caught males. Focke[12] did not notice any appreciable difference at same temperature of frogs recently caught and those kept in captivity for several months. Houghton[15] and Hale[12] believe frogs vary but little if kept cool and have access to running water, and in the main this has been my experience. When the frogs first arrive they are not very resistant, but after a week or ten days do not vary greatly.

Season appears to play a greater part than captivity: Fagge and Stevenson[10] and Ziegenbein[23] concluded season made but very little difference. Focke[11] thinks frogs should be caught not earlier than the end of June and advises the examinations to be made in July, August and September, during which time the susceptibility does not vary greatly, while in the spring the average values are considerably lowered. Dixon[5] finds frogs most active and vigorous and more resistant in summer, least in spring. Moskowitsch[18] found July frogs more resistant in July than in winter. Focke[11] was first to call attention to the influence of temperature and in fact appears to be the only one who has carried out any investigation to determine just what influence temperature changes might have. Hale[12] says the temperature is a primary and important essential and gives it as one of the precautions to be observed in using the frog as an assay animal. He advises making all assays at 22° C., this being ordinary room temperature and the one most easily maintained. And while a slightly higher temperature might not be inconsistent with accuracy on account of the easy susceptibility of frogs to heat lower temperatures are to be preferred to high. The Committee of the Philadelphia Branch of the Am. Ph. Assoc'n reply to Dr. Hale's discussion before the Philadelphia Branch in which he made the statement that the difference due to temperature may be overcome by working always in a room of certain temperature; by saying, " We are not familiar, however, with any experimental proof of this statement, and it seems a priori improbable."

Very little work appears to have been done to determine the effects variation of temperature would have upon the susceptibility of frogs and in our laboratory, one of us, Dr. Haskell, convinced that the variations in temperature played a considerable part in the susceptibility of the frogs, injected a series of frogs in the still room where the temperature was very high. He found that the M.L.D. by the one-hour method was considerably less than at ordinary room temperature; following this, I decided to carry out a series of experiments to determine more fully the effects of temperature on the susceptibility of the frogs.

All of our frogs with the exception of one lot come from Illinois. As soon as they arrive they are unpacked and placed in the frog cellar in galvanized iron tanks. These tanks are about two feet square and six inches deep, being fitted with a wire net cover. The tanks are slanted so that running water may cover about one-half the cage bottom. The temperature in this cellar did not go above 15° C. during the time these experiments were in progress. After unpacking, the frogs are allowed to remain in this cellar at least ten days before being used. They are brought from the cellar to the operating room in such quantities as are required, carefully weighed, and placed in individual cages in a thermostat where they are allowed to remain for an hour at the temperature at which it is desired to operate before they are injected. The doses are calculated per gram body weight, measured out and diluted to 0.015 c.c. per gram body weight. Five doses are prepared and injected quickly so that each series may be subjected to as near identical conditions as possible.

The method is the one-hour frog-heart method suggested by Cushny and advocated by Famulener and Lyons.

Just before the end of sixty minutes the frogs are pithed, brain and cord and heart exposed. The complete cessation of the ventricle in systole, with the auricle still beating or responding to stimulation, is taken as the end point. If, when the lymph sac is opened there is any excess of moisture present, the result is noted as non-absorption and the experiment is not considered in drawing conclusions. The females are used for preliminary tests and the end point determined on selected male frogs.

A protocol of the first experiment is given below:

1-12-12. OUABAIN 1 : 10000 IN 25 PER CENT. ALCOHOL. FROG LOT 246.

15° C.

Weight of frog.	Dose in gms. per gm body weight.	Results.
27.3	0.0000008	— Beats
21.8	0.0000008	— Beats
25.5	0.0000009	— Beats
28.4	0.0000009	+ Stopped
22.5	0.0000010	— Beats Nonabs.
22.7	0.0000010	+ Stopped

M.L.D. 0.0000010

20° C.

Weight of frog.	Dose in gms. per gm. body weight.	Results.
20.0	0.0000005	— Beats
28.2	0.0000006	— Beats close
28.3	0.0000006	+ Stopped
26.1	0.0000007	+ Stopped past
25.6	0.0000008	+ Stopped past
20.4	0.0000008	+ Stopped past
	M.L.D. 0.0000006	

30° C.

Weight of frog.	Dose in gms. per gm. body weight.	Results.
26.2	0.0000002	— Beats
20.8	0.0000003	+ Stopped
22.8	0.0000004	+ Stopped past
24.6	0.0000004	+ Stopped past
27.0	0.0000005	+ Stopped past
	M.L.D. 0.0000003	

Variation in temperature appears to be a very important factor in the susceptibility of frogs, their resistance decreasing as the temperature increases; subsequent experiments not only substantiated the above results but demonstrated the variation in susceptibility of different lots of frogs.

The results emphasize the necessity of using a preparation to standardize the frogs for each series of assays. Just what this standard should be workers differ. To be of any value it must be one that will exactly represent and parallel the activity of the preparation to be tested and must be of good keeping quality. Focke[12] advocates properly prepared and preserved digitalis leaves, making an infusion for testing. Hale, however, has demonstrated the variation which may occur in preparations made from the same lot of leaves, due probably to faulty technic in the process in extraction. Tincture of digitalis has been suggested, but the work of Houghton and Hamilton and that of Hale demonstrates the deterioration which may take place and the inadvisability of using a galenical preparation for a standard notwithstanding Houghton's results with Trs. of Strophanthus: Houghton recommends Kombe strophanthin and Hale suggests ouabain or crystalline digitoxin, either of which are definite chemical substances and so far as is known are stable.

In order to determine whether the susceptibility of frogs varied concomitantly for Ouabain and Strophanthus, a 5 per cent. and a 10 per cent. Tr. of Strophanthus bought on open market were assayed along with a 1 : 10000 solution of Ouabain in 25 per cent. alcohol, the tinctures being diluted so as to bring the alcoholic strength to 25 per cent.

The results are given in the following table:

	Ouabain 1 : 10000	Tr. Strophanthus 10 per cent.	Tr. Strophanthus 5 per cent.
10° C.	0.0000008	0.00008	0.00020
20° C.	0.0000004	0.00005	0.00012
30° C.	0.0000002	0.00002	0.00006

The variation for Ouabain and Strophanthus therefore are very closely parallel.

Having received about this time a small consignment of frogs (averaging about 50 grams) from Minnesota, I used them in this set of experiments with the following results:

	Ouabain 1 : 10000	Tr. Strophanthus 10 per cent.	Tr. Digitalis 10 per cent.
10° C.	0.0000010	.00017*	.006*
20° C.	0.0000008	.00009	.004
30° C.	0.0000003	.00004	.003

As in the previous experiments the variation is closely parallel for Ouabain and Strophanthus, but the digitalis did not show the same ratio of variation. In order to investigate this more fully the experiment was repeated, using frogs weighing 15 to 20 grams, with the following results:

	Ouabain 1 : 10000	Tr. Strophanthus 10 per cent.	Tr. Digitalis. 10 per cent.
10° C.	0.00000080	0.000080	0.0040
20° C.	0.00000045	0.000040	0.0040
30° C.	0.00000020	0.000025	0.0030

By these results I believe I have demonstrated the necessity of using some preparation to standardize the frogs for each assay.

I have demonstrated that while Ouabain or Strophanthus preparations may be used to standardize Strophanthus, they are unsuitable as standards for digitalis and its preparations. For this reason it may be inadvisable to use any of the Strophanthus or digitalis preparations to standardize Apocynum, Convallaria or Squill.

Hale has recommended crystalline digitoxin to standardize digitalis and I have already begun a series of experiments with the glucosides of digitalis and its allies with reference to a standard for each. These will be assayed by both the one-hour method of Cushny and the twelve-hour method of Houghton.

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* I did not have enough frogs to complete the end point for these two. The dose given was the smallest dose administered and was fatal.

BIBLIOGRAPHY.

[1] Barger and Shaw: "The Chemical and Physiological Assay of Digitalis Tinctures." *Pharm. Jr. and Tr.* (London), Vol. lxxiii, 1904.

[2] Bührer: "Untersuchung über die Wirksamkeit einiger toxisch Fluid-Extracte." Inaug. Dissert., Basel, 1900.

[3] Chevalier: *"Les Nouveau Remedes,"* 1910, Vol. xxvii.

[4] Crawford: "Notes on Physiological Testing." Am. Jr. Pharm., Vol. lxxx, 1908.

[5] Dixon: "Biochemical Standardization of Drugs." *Pharm. Jr. and Tr.* (London), 1908.

[6] Eckler: "Experiments with the Cat Method for Testing Digitalis and its Allies." Am. Jr. Pharm., Vol. lxxxiii, 1911.

[7] Edmunds: "Standardization of Cardiac Remedies." *Jr. A.M.A.,* Vol. xlviii, 1907.

[8] Edmunds and Hale: "The Physiological Standardization of Digitalis." Bull. No. 48. Hyg. Lab., U. S. Pub. Health and Marine Hospital Service.

[9] Famulener and Lyons: "Relative Strength of the Various Preparations of Digitalis and Kindred Drugs as shown by Experiments on Frogs." Proc. Am. Pharm. Assoc., Vol. l, 1902.

[10] Fagge and Stevenson: "Application of Physiological Tests for certain Organic Poisons, Especially Digitalin." Reprinted from Guy's Hospital Reports 1866.

[11] Focke: "Die Physiologische Wertsbestimmung der Digitalisblätter." *Arch. der Pharmazie* (Bd. 241, 1903). "Weiteres zur physiologischen Prüfung der Digitalisblätter," *Ibid.,* Bd. 245, 1907. "Die kurzzeitige injektionsmethode der physiologischen Digitalis und Strophanthusprüfung,"*Ibid,* 248, 1910.

[12] Hale: "Digitalis Standardization and the Variability of Crude and Medicinal Preparations." Bull. No. 74. Hyg. Lab. U. S. Pub. Health and Marine Hospital Service.

[13] Hatcher: "Tincture of Strophanthus." *Jr. A.M.A.,* Vol. xlviii, 1907.

[14] Hatcher and Brody: "The Biological Standardization of Drugs." Am. Jr. of Pharm., Vol. lxxxii, 1910.

[15] Houghton: "The Pharmacological Assay of the Heart Tonics." *Jr. Am. Med. Assoc'n,* Vol. xxxi, 1898.

[16] Koppe: "Untersuchung über die pharmakologischen Wirkungen des Digitoxins, Digitalin and Digitaleins." *Arch. fur exper. Path. und Pharm.,* Bd. 3, 1875.

[17] Laborde: "*Comp. rend. hebd. des Seances et Mem. de la Soc. de Biol.,*" Vol. xxxvi, 1884.

[18] Moskowitsch: "Zur Wertsbestimmung der Preparate der Folia Digitalis." *Arch. der Pharm.,* Bd. 241, 1903.

[19] Prevost: "Essais Pharmacologique sur quelques preparations de la Phar-

macopee helvetique," Edition III, *Revue Medicale de la Suisse Romande,* 1893. "Nouveau essais pharmacologiques, sur quelques Preparations de la Pharmacopee helvetique," Edition III, *Ibid,* 1895.

[20] Reed and Vanderkleed: "The Standardization of Preparations of Digitalis by Physiological and by Chemical Means." AM. JR. OF PHARM., Vol. lxxx, 1908.

[21] Report of Committee of Philadelphia Branch of the American Pharmaceutical Association on Pharmacological Assay, *Bulletin of the American Pharmaceutical Association,* Jan., 1911.

[22] Vanderkleed: "Variation in the Susceptibility of the Guinea Pig to the Heart Tonic Group." AM. JR. OF PHARM., Vol. lxxxiv, 1912.

[23] Ziegenbein: "Wertsbestimmung der Digitalisblätter." *Arch. der Pharm.,* Bd. 240, 1902.

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NOTES ON THE BOTANY OF MEDICINAL PLANTS.

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I. THE ANGUSTURA BARK TREE.

The botanical source of Angustura bark is a subject which has always been wrapped in a certain amount of mystery. The fact that the drug is collected in a remote part of South America seldom visited by botanists resulted in the early days in many wild guesses as to its origin. At one time it was even thought to come from a tree native to Abyssinia; later it was regarded as the bark of some species of Magnolia. Not until Humboldt and Bonpland visited the Orinoco region, something over a century ago, does there seem to have been any light shed upon the subject. These botanists while sojourning at Angustura obtained from an Indian leaves of a tree, growing in the Province of Carony, said to be that producing Angustura bark. Later a tree having similar leaves was discovered by them growing in the Province of Cumana, to which they gave the name "*Cusparia febrifuga.*" Humboldt's description of this plant, given in the Essai sur la Geographie des Plantes, pp. 58 and 63 (1805), is meagre, but his assertion that it is the "majestic tree which furnishes the cortex angusturae," together with other minor details, serve to identify it with the plant sent by him to Willdenow and already described by the latter under the name of *Bonplandia trifoliata* (Mém. Acad. Berlin, 1802). This name was afterward adopted by Humboldt and Bonpland.

In 1819 Roemer and Schultes changed the name of the genus to *Angostura* and gave the species in question the name of *Angostura cuspare*. This species was later united with the genus *Galipea* by St. Hilaire, who applied to it the name *Galipea cusparia*.

In 1877 Engler, in monographing the Rutaceae for Martius' Flora Brasiliensis, renamed this species *Cusparia trifoliata,* in accordance with the modern ideas of priority in botanical nomenclature.

In 1828 Dr. John Hancock read a paper before the Medico-Botanical Society of London, in which he maintained that the tree discovered by Humboldt and Bonpland is not the source of Angustura bark, but that the bark is derived from an undescribed species native to Carony, but not found in Cumana. Hancock gave to this tree the name "*Galipea officinalis.*" It is said that he afterward accepted the genus *Cusparia* of Humboldt and changed the name of his species to "*Cusparia officinalis,*" but I have been unable to verify this statement. Since Hancock spent some months in the country where the Angustura bark is gathered, his paper is of especial interest.

In order to obtain as much light as possible on the source of Angustura bark, as well as on the synonymy of the species supposed to furnish it, I have looked up every available description in the earlier botanical works and will give at this time the results of my researches.

The genus *Galipea* of the Rutaceae was founded in 1775 by Aublet, who described in his "Plantes de Guiane" a single species to which he applied the name "*Galipea trifoliata.*" Willdenow recognized that the tree discovered by Humboldt and Bonpland differed in several details from any genus known to him, and created for it the genus *Bonplandia*. This name, however, cannot be retained for this genus as it had already been employed by Cavanilles in 1800 for a genus of a different family. It is necessary, therefore, to adopt the name next in order, viz., *Cusparia* of Humboldt and Bonpland.

Not all of the early botanists by any means were willing to concede the validity of this genus or to recognize it as distinct from *Galipea*. As already noted, St. Hilaire gave Humboldt's species the name of *Galipea cusparia*, while Baillon, recognizing the specific name given by Humboldt, named the tree *Galipea febrifuga*. Hancock also in his paper, already mentioned, regards the true Angustura bark tree as a *Galipea*. The distinctions between these genera were clearly pointed out at last by Engler, and *Cusparia* seems to be universally accepted at present as a valid genus.

Although *Galipea officinalis* of Hancock is mentioned in Index Kewensis as a distinct species, it is customary for most writers upon medicinal plants to regard this species as the same as that of Humboldt and Bonpland. The following summary of contrasting characters should demonstrate that Hancock's species is distinct:

Cusparia officinalis Hancock.	*Cusparia trifoliata* (Willd.) Engl.
Small tree less than 20 feet high.	Tree 60 to 80 feet tall.
Leaves alternate, trifoliate; leaflets 6 to 10 inches long and 2 to 4 inches broad; petiole nearly the same length as the leaflets.	Leaves alternate, trifoliate; leaflets 1 to 2 feet in length; petiole 10 to 11 inches in length.
Fresh leaves have odor resembling tobacco.	Fresh leaves have extremely agreeable aromatic odor.
Calyx one-fourth as long as the corolla.	Calyx half as long as the corolla.
Corolla irregular, two of the five petals being one-ninth longer and larger than the others; somewhat curved before expansion.	Corolla regular or with one petal slightly unlike the others.
Fertile stamens 2, inserted in throat of corolla; anthers linear, longer than the filaments, without appendage at the base.	Fertile stamens 2, inserted in throat of corolla; anthers oblong or linear-oblong, about the length of the filaments, terminated below by two short, pointed appendages.
Sterile stamens five, linear, much longer than filaments of fertile stamens, inserted in throat of the corolla at a lower level than the fertile stamens.	Sterile stamens 3 or 4, longer than fertile stamens, inserted in the throat of the corolla at nearly the same level as the fertile stamens, the expanded membraneous bases of all stamens united into a thin sheet, which lines the lower part of the corolla tube, being entirely adnate with it.
Pistil 5-lobed, depressed, surrounded by an obscurely 8 or 10 notched coriaceous outgrowth from the receptacle; style filiform; stigma capitate.	Pistil of 5 oblong, obtuse lobes surrounded by a 10-parted corona; style filiform; stigma subovoid with 5 erect, joined, oblong, obtuse divisions.
Fruit 5 gibbous, bivalve capsules, of which 2 or 3 are generally abortive; endocarp strong, horny, elastic, causing the capsules to burst when dried; seeds 2 in a capsule, one usually abortive.	Fruit 5 oval, bivalve capsules; seeds solitary, no mention of horny, elastic endocarp or of abortive capsules and seeds.

Finally it is worthy of note that Aublet's species, *Galipea trifoliata*, has sometimes been confused with the plant discovered by Humboldt and Bonpland, probably because of Willdenow's description of the latter as *Bonplandia trifoliata* and the subsequent confusion of the genus *Bonplandia* or *Cusparia* with *Galipea*. Thus Sprengel's species, *Galipea corymbosa* is regarded in Index Kewensis as synonymous with *Cusparia febrifuga*, notwithstanding that Sprengel specifically states that his species is *Galipea trifoliata* Aubl. and his description agrees with Aublet's account of that species.

A list of all the synonyms found for these three species, together with the authority and the place and date of first publication as far as known, is given below:

Galipea trifoliata, Aublet, Plantes de Guinane, ii, 662, t. 269 (1775).
Sciuris trifoliata, Nees and Martius, Nov. Act. Nat. Cur., xi, 155 (1823).
Sciuris corymbosa, Sprengel, Syst. Veg., i, 38 (1825).
Galipea corymbosa, Sprengel, Syst. Veg., iv, Cur. Post., 91 (1827).

Cusparia trifoliata (Willd.) Engler, in Martius' Flora Brasil., xii, ii, 113 (1877).
Bonplandia trifoliata, Willdenow, Mém. Acad. Berlin, Philos. Exper. 24–28 (1802); Humboldt and Bonpland, Pl. Equinox., ii, 52 t. 97 (1809); Humboldt, Bonpland and Kunth, Nov. Gen. et Spec., vi, 7 (1823).
Cusparia febrifuga. Humboldt and Bonpland, Essai Geog. Pl. 58 and 63 (1805); De Candolle, Mém. Mus. Nat. Par., ix, 144 (1822).
Bonplandia angostura, Richard, Mém. Math. Phys. Inst. Fr. (1811), Pt. ii, 82, t. 10.
Angostura cuspare, Roemer and Schultes, Syst. Veg., iv, 188 (1819).
Galipea cusparia, St. Hilaire in De Candolle, Prodromus, i, 73 (1824).
Galipea febrifuga, Baillon, Dict. Bot., ii, 667 (1886).
Cusparia Angostura (Rich.) Lyons, Plant Names, Ed. I, 127 (1900).

Cusparia officinalis, Hancock, Ref. in U. S. Disp. Ed. 19, 416 (1907).
Galipea officinalis, Hancock, Tr. Med. Bot. Soc. London, 25 (1829).

II. The Source of Buchu Leaves.

The buchu leaves imported into this country from South Africa are mainly of two types, the short buchu now official in the United States Pharmacopœia, and the long buchu, formerly official and still retained in the pharmacopœias of some countries. A third form known as spurious buchu is occasionally imported. These leaves are the product of three closely related species of small rutaceous shrubs which have received at various times an unusually great variety of botanic names. It is perhaps due to the confusion arising from this extensive synonymy that these plants have never received the names to which they are entitled in conformity with the accepted rules of priority in nomenclature. It is the writer's object in this paper to combine the earliest specific name with the first valid generic name applied to these plants, to trace briefly the history of each species, and to give a full list of synonyms, together with the authority and the place and date of first publication.

The first of these species to receive a name was the spurious buchu which was described by Torner in 1756 and named by him *Diosma crenulata.* The genus *Diosma* was created by Linnaeus in 1735 and retained by him in Species Plantarum. A large number of species have been assigned to this genus but later botanists have subdivided it to a great extent and placed most of the species in other genera. The section to which the species here considered belong was first characterized by Wendland in 1808 and named by him *Parapetalifera.* This name seems not to have been adopted by other botanists partly on account of its length and partly because the rarity of Wendland's work caused the name to be overlooked. Nevertheless it is the first valid name applied to the genus and the one which must be adopted by reason of its priority, since the length is not now considered objectionable. Wendland renamed Torner's species *Parapetalifera odorata,* but it is necessary to apply the specific name used by Torner, hence the correct name of the species becomes *Parapetalifera crenulata.*

In 1819 Roemer and Schultes described this species under the name *Bucco crenata*, combining a specific name used by Linnaeus in 1759 with a generic name first used by Wendland in 1808, but applied by him to a distinct group of species most of which are now referred to *Agathosma.* The latter genus was first characterized by Willdenow in 1808 and includes many species. It is commonly regarded as a valid genus though it should probably be replaced by *Hartogia* of Linnaeus (1759), in which case *Hartogia* of the younger Linnaeus (1781) should be replaced by *Schrebera* of Schreber (1773). In 1821 Link named this species *Adenandra cordata*, referring it to a genus first used by Willdenow in 1809 and considered valid at the present time though it may have to be replaced by *Glandulifolia* of Wendland (1808). Burchell in his "Travels in Africa," published in 1822, gives an account of the use of buchu leaves in dressing wounds and states in Vol. I, page 479, that the species used is *Diosma serratifolia*, though the plant illustrated on page 476 is evidently *Parapetalifera crenulata.*

The name *Barosma* by which these plants are commonly known at the present time was first employed by Willdenow in 1809. The spurious buchu was first referred to this genus in 1824 by Bartling and Wendland, who considered it as var. β of *Barosma serratifolia,* though the name *Barosma crenulata*, given to the plant by Hooker in 1835, is the one now commonly accepted.

Of the species here considered, the second to be described was the official short buchu to which Bergius applied the name *Hartogia betulina* in 1767. Though the plant is not properly an *Hartogia* but a *Parapetalifera,* it has never been given a name in the latter genus. The writer will therefore apply to it the name *Parapetalifera betulina.* In 1794 Thunberg gave this species the name *Diosma betulina*. from which circumstance Thunberg is commonly regarded as the original authority for the specific name, although as noted the name was first employed by Bergius. Bartling and Wendland in 1824 named this species *Barosma betulina,* which is the name commonly used at present.

The long buchu was the last of the three species to receive a name. In 1799 it was described by Curtis, who gave it the name *Diosma serratifolia.* Wendland described this species in 1808 as *Parapetalifera serrata,* though the specific name employed by Curtis should be used. The writer has accordingly given this species the name *Parapetalifera serratifolia.* The genus *Barosma* was created for this plant by Willdenow in 1809 and the present species was named by him *Barosma serratifolium.* In 1819 Roemer and Schultes named this species *Baryosma serratifolia.* The generic name is evidently a corruption of *Barosma.* The plant is now usually called *Barosma serratifolia*, a name given to it in 1824 by Bartling and Wendland.

The following list includes all the synonyms which it has been possible to identify with any of the three species considered in this paper:

Parapetalifera crenulata (Torner) Young.
Diosma crenulata, Torner, Cent. II Plant. in L. Amoen. Acad. Ed. I, 308 (1756).
Diosma crenata, Linnaeus, Syst. Ed. X, Vol. ii, 940 (1759).
Diosma latifolia, Andrews, Bot. Repos. I, t. 33 (1797).
Parapetalifera odorata, Wendland, Collect. Plant. I, 50, t. 15 (1808).
Bucco crenata, Roemer and Schultes, Syst. Veg., v, 444 (1819).
Adenandra cordata, Link, Enum. Plant. Hort. Berol. Pt. I, 239 (1821).
Diosma serratifolia, Burchell, Trav. in Afr., i, 476 and 479 (1822).

Barosma serratifolia var. β, Bartling and Wendland, Beitr. zur Bot., i. Diosmeae, 99 (1824).
Agathosma latifolia, Loudon, Hort. Brit. Pt. i, 85 (1830).
Barosma crenata, Ecklon and Zeyher, Enum. Plant. 102 (1835).
Barosma crenulata, Hooker, Curt. Bot. Mag., Vol. ix, N. S. t. 3413 (1835).

Parapetalifera betulina (Bergius) Young.
Hartogia betulina, Bergius, Descr. Plant. Cap. 67 (1767).
Diosma betulina, Thunberg, Prodr. Plant. Cap. 43 (1794).
Bucco betulina, Roemer and Schultes, Syst. Veg., v, 443 (1819).
Diosma crenata, Loddiges, Bot. Cab. V, t. 404 (1820).
Barosma betulina, Bartling and Wendland, Beitr. zur Bot. I, Diosmeae, 102 (1824).
Barosma crenata, Sweet, Hort. Brit. Pt. I, 89 (1826).
Barosma orbicularis (Hort.) Sweet. Hort. Brit. Pt. I, 89 (1826).
Baryosma betulina, Loudon, Hort. Brit. Pt. I, 85 (1830).

Parapetalifera serratifolia (Curtis) Young.
Diosma serratifolia, Curtis, Bot. Mag. XIII, t. 456 (1799).
Parapetalifera serrata, Wendland, Collect. Plant. I, 92 t. 34 (1808).
Barosma serratifolium, Willdenow, Enum. Plant. Hort. Berol., 257 (1809).
Baryosma serratifolia, Roemer and Schultes, Syst. Veg. V, 448 (1819).
Adenandra serratifolia, Link, Enum. Plant. Hort. Berol. Pt. I, 239 (1821).
Barosma serratifolia, Bartling and Wendland, Beitr. zur Bot. I, Diosmeae, 98 (1824).

EARLY DAYS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

By Ewen McIntyre.

To many of you it may be of interest to note some of the conditions leading up to the organization of this Association. America, gradually by reason of the entire absence of any inspection or standard of quality as to goods and merchandise, passed all importations through our custom houses, collecting only the duties. Hence, we became the dumping ground of European rubbish of all kinds and sorts. Especially had this become the practice relating to chemicals, pharmaceutical preparations and drugs; so much so, that it had become a crying evil demanding action from some one or some source. Finally the College of Pharmacy of New York City took up the matter in earnest, secured a number of preparations and samples from identified sources and had the samples carefully analyzed. This was in 1845. The result was that mercurial ointment and blue pill were found deficient in mercury which was replaced by certain earthy matters. The report was sent to your College (see Am. Jour. Phar., page 257, 1846). A sample of so-called Quinine, handed to William Procter, Jr., turned out on examination, to be Salacine; also blue pill mass with less than ¼ proper strength. This sample was given by Charles Ellis and said to have been from an agent in New York City of an English manufacturer at New Castle-on-Tyne (see Amer. Jour. Pharm., 1847, Vol. 13, page 305 to 309). There will be found a long account of practice of adulteration then prevailing and it is also stated, "We are informed by an agent of an English manufacturer of chemicals, etc., used in medicine, that it is a regular and systematic business to make articles for American markets of different qualities; one for Atlantic cities and much inferior, marked 'for the West.'" A report of this was made by the New York College, at a meeting called for the purpose of considering some measure to prevent the introduction of spurious and sophisticated chemicals and pharmaceutical preparations.

At a meeting of wholesale druggists in Boston, resolutions were adopted and sent to the New York College of Pharmacy, John Milhau, President, with the request that it be submitted to the Chairman of the Committee in Congress. The resolution recited: "A spurious article has been imported from Smyrna as opium, a part of which by analysis, has been proved to contain no morphine, and was sold on the 8th inst. at three and five cents a pound, another spurious lot at $1.35 a pound. Also other lots of a similar spurious article are on their way here and that a regular business of preparing and putting it up is carried on in Turkey," etc. The Boston druggists in these resolutions, promised to aid the druggists in other cities in prosecuting impositions of the kind. On the next page of the Amer. Jour. of Phar., you will find an extract from the report of Dr. Edwards, read before the House of Representatives on imported adulterated drugs and medicines. The extracts from this report cover nearly 20 pages of the Journal (203 to 223) and so, at last the country had awakened to the need of some practical remedy to put a stop to the awful condition then existing and an act to prevent importations of adulterated and spurious drugs and medicines was approved and signed on the 26th of June, 1848.

At a special meeting of the New York College of Pharmacy, held July 6th, 1848, preamble and resolutions were unanimously adopted (page 209 of the American Journal of Pharmacy):

"Resolved, we will collectively and individually give our earnest aid to make this statutory law effective in all its parts," etc., etc., and finally resolved that copies of the foregoing preamble and resolutions be presented to each of the Colleges of Pharmacy and of Medicine in the United States and that they be published in the newspapers at the discretion of the President and Secretary, copies be offered to the Journals of Pharmacy and Medicine in this country and the *Pharmaceutical Times and Journal of Chemistry* and the *Journal de Pharmacie*, Paris.

From this time on, but little was done until a united call by the New York and Philadelphia Colleges was made for a meeting of pharmacists and delegates to meet October 15th, 1851, at the rooms of the New York College. At this meeting delegates were present from Philadelphia, Boston and New York, no delegates from Baltimore or Cincinnati, although they had previously notified the Committee of Arrangements of their intention to be present. Charles Ellis, of Philadelphia, was called upon to preside and Samuel R. Philbrick, of Boston, as Secretary, committees chosen to pass on delegate and nominate officers, Samuel Colcord, Boston, Alfred B. Taylor, Philadelphia, George D. Coggeshall, N. Y. (my employer). Committee reported credentials correct and nominated C. B. Guthrie for President of New York and Alfred B. Taylor, of Philadelphia, Secretary.

The Association as I remember was given the name of the National Pharmaceutical Association, and after urging and recommending mutual support and protection, the need of education of assistants, the great need of annual meetings, a meeting was called for the first Wednesday in October, 1852, for a National convention to meet every year. Geo. D. Coggeshall, New York, S. M. Colcord, Boston, and William Procter, Jr., Philadelphia, a committee to recommend and collect information, etc., to be presented at the next convention. The next meeting was held at Boston, August 24th, 1853, and at this meeting as I gather, the name of the Association was made the American Pharmaceutical Association, so as to cover a larger and more comprehensive field.

PROGRESS IN PHARMACY.

A QUARTERLY REVIEW OF SOME OF THE MORE INTERESTING LITERATURE RELATING TO PHARMACY AND MATERIA MEDICA.

By M. I. WILBERT,
Washington, D. C.

Of the many interesting happenings in the pharmaceutical world during recent months few have attracted more widespread attention and none has been commented on so extensively as the resignation of Dr. Harvey W. Wiley, for 29 years Chief of the Bureau of Chemistry of the Department of Agriculture.

An editorial (*J. Am. Ass.*, 1912, v. 58, pp. 865–866) commenting on the resignation of Dr. Harvey W. Wiley as Chief of the Bureau of Chemistry, calls attention to his personal statement regarding the reasons for his resignation, which is reprinted (*Ibid.*, pp. 875–876).

Xrayser II, in commenting on the resignation of Dr. Wiley, points out that it is significant that pharmaceutical and medical journals seem to be unanimously of the opinion that his leaving office is synonymous with a setback to American commercial morality in so far as the purity of food and drugs and the branding of medicinal preparations is concerned. Dr. Wiley himself announces that he is going to devote his life to the cause he has at heart, in the hope that as a free-lance he may be of even greater service to his country. *Chem. and Drug.*, 1912, v. lxxx, p. 575.

PURE FOOD AND DRUG LAW.—A news note (*Oil, Paint and Drug Reporter,* 1912, v. 81, May 6, pp. 33–34) presents a lengthy report of the hearings on the proposed amendments to the Pure Food and Drugs Act, and states that at the final meeting of the Committee it was decided to submit all of the pending bills, including the Sherley bill and the Richardson bill, to a sub-committee to consider the several questions and the hearings thereon and to submit to the full committee a draft of such legislation as the sub-committee may deem advisable in the premises.

THERAPEUTIC EFFICIENCY.—An editorial (*J. Am. M. Ass.*, 1912, v. 58, pp. 1121–1122), in discussing the frequently made assertion that therapeutic efficiency should be the one important consideration in determining the value of a remedy, points out that many evidently fraudulent articles must be acknowledged to be therapeutically efficient, though the efficiency in any given quantity or the quantity furnished at a given price is frequently far below that of other well-known medicaments.

ANTINARCOTIC LEGISLATION.—An editorial (*Drug. Circ.*, 1912, v. 56, pp. 181–182) comments on the attitude of druggists generally toward antinarcotic legislation, and asserts that the people at large are beginning to appreciate the possible harm from the indiscriminate and widespread use of morphine and cocaine and that something far-reaching must be accomplished by means of which it will be possible to satisfactorily restrict the use of these drugs. The editorial concludes that the present situation is bad and must be improved. Pharmacists who oppose legislation, to restrict the use of narcotic drugs are classed as being in opposition to the best interests of the public at large, and after all that which is best for the public is best for pharmacy.

THE NATIONAL FORMULARY.—An editorial (*Journal of the Missouri State Medical Association*) defines the National Formulary as being pharmaceutically useful but not a therapeutic necessity, and calls attention to some of the objectionable features of the book from a present day, up to date, point of view. Incidentally it points out that, although liquid preparations of pepsin and pancreatin are acknowledged to be pharmaceutical impossibilities, and in spite of a specific appeal from the Council on Pharmacy and Chemistry of the American Medical Association to omit elixir digestivum compositum, the worthless imitation of a popular humbug, from the next edition, it apparently has been decided to retain this preparation. *J. Am. Med. Ass.*, 1912, v. 58, pp. 1030–1031.

U.S.P.—An editorial (*Drug. Circ.*, 1912, v. 56, p. 239), under the caption "When Will the New Revision of the Pharmacopœia Appear?" speculates facetiously on the date of the publication of the U.S.P. IX, and states that if the increase of a year for each interval continues, the ninth revision will appear thirteen years from 1905, which will be 1918, six years hence; while the tenth revision would not come from the binders' hands until fourteen years later, or 1932.

PH. GERM. V.—A book review (*Apoth. Ztg.*, 1912, v. 27, p. 215) calls attention to the Hager-Fischer-Hartwich "Kommentar zum Deutschen Arseneibuch, V. Ausgabe, 1910." This commentary which has been compiled by some of the leading pharmacists of Germany is perhaps the most comprehensive of the books so far published on the German Pharmacopœia and the promptness with which the book has appeared is generally commended.

Ph. Japon. III.—The Japanese Minister of the Interior has authorized a number of changes in the Japanese Pharmacopœia of 1907. These changes become official in July 1, 1912, and apply almost exclusively to the tests for purity, a number of the tests being revised and some additional new tests added. A total of 12 pharmacopœial articles are involved and some of the changes are quite comprehensive. In connection with powdered digitalis the direction has been included to thoroughly dry the powder and preserve it in completely filled bottles. Digitalis itself is not to be kept for more than one year. *Pharm. Ztg.*, 1912, v. 57, p. 307.

International Standards.—An unsigned article (*Südd. Apoth. Ztg.*, 1912, v. 52, p. 125) calls attention to the proposed international congress to be held in the Hague in 1913. At the general meeting of the "Nederlandsche Maatschappij ter bevordering der Pharmacie" it was decided to issue a general invitation for an international pharmaceutical congress to be held in 1913 at which questions of nomenclature, the unification of reagents and the international regulation of trade-marks might be discussed. The congress is to be held in connection with the opening of the Peace Palace and the centenary of the independence of the Netherlands.

Digest of Comments.—An editorial (*Meyer Bros. Drug.*, 1912, v. 33, p. 148) says: "The Digest of Comments on the U.S.P. VIII and N.F. III for the calendar year ending December 31, 1909, is now being distributed. It is Bulletin No. 79, Hygienic Laboratory, and can be obtained by interested parties by addressing Surgeon-General, United States Public Health and Marine-Hospital Service, Washington, D. C.

"This, the fifth of the present series of digests, is a volume of 735 pages. The editors have succeeded in bringing together, in very convenient form, an immense amount of information of interest and value to those in any way associated with pharmacopœial revision work or in pharmaceutical manufacturing or testing drugs. It is to be regretted that the bulletins cannot be issued promptly and brought up to date. The nature of the work and government methods, however, seem to render this impossible."

Annual Report of the Public Health and Marine-Hospital Service.—An editorial (*J. Am. M. Ass.*, 1912, v. 58, pp. 942–943) comments on the report of the Surgeon-General of the Public

Health and Marine-Hospital Service for the fiscal year 1911, and points out that this Service constitutes the sole national agency operating to combat epidemic disease and to promote public hygiene and sanitation. The editorial also reviews the various lines of investigations and the routine work accomplished by the officers of the Public Health and Marine-Hospital Service.

American Medicinal Herbs.—An unsigned note (*Chem. and Drug.*, 1912, v. 80, p. 548) calls attention to Bulletin No. 219 of the Bureau of Plant Industry, U. S. Department of Agriculture, by Miss Alice Henkel, which deals with American medicinal leaves and herbs. The Bulletin forms the third instalment on the subject of American plants, root-drugs and medicinal barks being dealt with in the two preceding ones. Besides descriptions, the synonyms and common names, collection, uses, and prices of the drugs are given.

Bulletin No. 150 of the Bureau of Chemistry, U. S. Department of Agriculture, entitled "*Technical Drug Studies by the Division of Drugs*," contains a number of contributions of practical value to the pharmacist. These include:

Hydrogen Dioxide Solutions.—Kebler, Warren and Ruddiman (pp. 1–23) report a comprehensive study of commercial solutions of hydrogen dioxide. Some of the analytical results have appeared in previous papers but in this publication they are accompanied by more or less interesting comments by the manufacturers of the several preparations. In discussing the results of the examinations the authors point out that acetanilide retards the deterioration of hydrogen peroxide solutions but that the inhibition is not uniform. They also suggest marketing this preparation with time limit labels.

Purity of Glycerin.—Kebler and Fuller (pp. 24–35) report an investigation of the nature of the purity of the glycerin marketed in this country, discuss the methods of analysis that were used and present a table giving their results. Comments by manufacturers are reproduced and the requirements that should be made of a high-grade glycerin are enumerated.

Alkaloidal Reactions.—Fuller, H. C. (pp. 36–40) presents some notes on two important alkaloidal reactions and reports a number of observations on the Vitali reaction and the sulphuric-acid bichromate reaction.

Cocaine.—The same (pp. 41–43) reports a number of observations on the separation and identification of small quantities of cocaine, and outlines the several reactions that are characteristic for this alkaloid. *Bull. Bur. Chem.*, U. S. Dept. Agric., 1912, No. 150, pp. 41–43.

Molybdic Trioxide.—Herstein, B. (pp. 44–46) discusses the determination of molybdic trioxide.

Ammonium Salts.—He also (pp. 47–48) outlines a method for testing ammonium salts by adding a previously neutralized solution of formaldehyde, and titrating with a standard solution of a fixed alkali until the pink color remains permanent after the solution has been brought to boiling.

Beeswax.—Kebler and Boyles report a study of the character of samples of beeswax submitted with bids, and present a table showing that out of 21 samples of yellow wax examined 10 were pure, 8 contained paraffin or mixtures of paraffin with other substances, 2 contained ceresin and 1 contained resin. Of the 5 samples of white wax examined 2 were pure, 1 contained paraffin, 1 paraffin and stearic acid and 1 ceresin. (Ibid., pp. 49–51.)

Iodine Value of Oils.—Harrison, E. F., reports experiments with the bromide-bromate method for determining the iodine value of fatty oils. Olive oil, oil of theobroma, lard and mutton suet gave results that were comparable with those obtained from Hübl's solution, but with arachis, almond, linseed, sesame, and cod-liver oils the bromide-bromate method gave results that were too low. *Pharm. J.*, 1912, v. 88, p. 509.

Cod Liver Oil.—A trade report on cod liver oil points out that the market quotation for new Norwegian oil has declined materially, owing to the abundant supply of new oil. The catch of cod and output of cod liver oil for the whole of Norway is reported as 35,900,000 cod and 28,932 hectoliters of oil in 1912, as compared with 17,300,000 cod and 12,574 hectoliters of oil in 1910.—*Chem. and Drug.*, 1912, v. 80, p. 454.

Adrenalin.—A news note (*Oil, Paint and Drug Reporter*, 1912, v. 81, May 6, p. 34) reports that the United States Circuit Court of Appeals of the Second Circuit has substantially upheld the decision of the Circuit Court for the Southern District of New York in regard to the patents on the suprarenal active principle, but does not include a ruling on the question covering chemical compounds having the same characteristic and reactions, produced wholly irrespective of the suprarenal glands, the court holding that the claims should be restricted to a substance in the production of which the suprarenal glands have played some part.

ALCOHOL.—An editorial (*J. Am. M. Ass.*, 1912, v. 58, p. 1203) points out that the ratio of insanity in Kansas has been materially reduced by the strict enforcement of the prohibition law; the ratio having decreased from 56.2 commitments to insane asylums per 100,000 of population in 1904, to 38.3 per 100,000 in 1911.

METHYL ALCOHOL.—An unsigned article (*Pharm. Ztg.*, 1912, v. 57, pp. 297–299) in discussing the fatalities recently noted in Berlin from the use of methyl alcohol, points out that the general lack of knowledge regarding the toxicity of methyl alcohol in Germany is due to the fact that this article has only recently become available at a moderate price.

Hausmann, Walther, discusses the toxic action of methyl alcohol and reviews some of the literature on the subject. He points out that fatal cases of poisoning from methyl alcohol are most numerous in connection with the use of this article as a beverage. The inhalation of vapors has resulted in a large number of cases of blindness, particularly in connection with occupations in which methyl alcohol is used as a solvent for varnishes or lacquers. Hausmann, also points out that the first cases of poisoning were reported by Viger and Mengin, from Normandy, in 1876.—*Pharm. Post*, 1912, v. 45, pp. 317–319.

A news note (*Pharm. Ztg.*, 1912, v. 57, p. 195) calls attention to the regulation adopted by the New York Board of Health on January 23, 1912, prohibiting the sale or exposing for sale of food or drink containing methyl alcohol or preparations or mixtures of methyl alcohol.

METHYL ALCOHOL, TEST FOR.—Hellriegel, A. (*Pharm. Ztg.*, 1912, v. 57, p. 7) believes that the production of the dimethyl ester of oxalic acid is more simple and certain than any of the oxidation tests for methyl alcohol.

ANTITYPHOID VACCINATION.—Major Frederick F. Russell reports the results of antityphoid vaccination in the army in 1911 and discusses its suitability for use in civil communities. He concludes that antityphoid vaccination in healthy persons is a harmless procedure, that it confers almost absolute immunity against infection, that all persons coming in contact with cases of enteric fever should be immunized and that general vaccination should be urged whenever the typhoid rate is high.—*J. Am. M. Ass.*, 1912, v. 58, pp. 1331–1335.

Aspirin.—Gehe & Co., in discussing the Ph. Germ. V. tests for free salicylic acid in acetylsalicylic acid, point out that this test is inefficient in that the addition of borax, sodium phosphate, tartaric acid, citric acid and other oxy-acids will readily prevent or mask the color ordinarily produced with ferric chloride.—*Pharm. Ztg.*, 1912, v. 57, p. 311.

Bismuth Paste.—Bell, F. McKelvey, reports on his experience with a bismuth paste made by intimately mixing bismuth subnitrate, 10 Gm., with petrolatum, 20 Gm., and concludes that this mixture is efficacious in facilitating drainage for acute suppurating sinuses but does not assist in rapidity of cure, and should never be used in clean wounds as it retards healing and tends to chronic conditions.—*J. Am. M. Ass.*, 1912, v. 68, pp. 1339–1341.

Camphor.—An editorial (*J. Am. M. Ass.*, 1912, v. 58, p. 1204) comments on the possible utilization of the leaves of the camphor tree as a source of camphor.

Codeonal is a combination of codeine with diethyl-bartituric acid, being a crystalline body melting at 85°, and soluble in 30 parts of water. It contains 7.4 per cent. of combined codeine.—*Chem. and Drug.*, 1912, v. 80, p. 580.

Confectionery.—An editorial (*J. Am. M. Ass.*, 1912, v. 58, pp. 1202–1203) comments on the Pennsylvania report on cheap confectionery by Charles H. LaWall, and points out that while there is a general improvement in the quality of cheap candies some of the ingredients are not what they should be. The general filthy condition of candies of this type is commented on and the recommendation made that manufacturers be compelled to wrap all candies in paraffin paper before marketing them.

Diastase Preparations.—An unsigned article (*J. Am. M. Ass.*, 1912, v. 58, p. 954) quotes Chevalier as reporting that the diastasic power of malt, or malt extracts, and of malt flours, deteriorates rapidly. The most durable preparations are the dry extracts or pastes which have been prepared at low temperatures. Pharmaceutic specialties which are claimed to contain malt, pepsin, pancreatin, etc., were found to possess no diastasic power whatever, and in others the hydrolyzing power was so attenuated as to be practically *nil.*

Digitalis.—Kraft (*Arch. Pharm.*, 1912, 118) has isolated two new glucosides from digitalis leaves. Gitalin is a water-soluble glucoside, forming an amorphous white powder melting at 150°–155°. Gitin is a new glucoside obtained from the alcoholic extract of the leaves, melting at 260°–265°, and yielding galactose and digitogenin on hydrolysis. It appears that the so-called digitalein is an impure form of gitalin.—*Chem. and Drug.,* 1912, v. 80, p. 580.

ERGOT.—Burmann (*Schweiz. Wchnschr. Chem. u. Pharm.,* 1912, 85) reports that he has isolated from ergot a new base, which has a very similar physiological action to that of adrenalin, and which is in all probability tyrosamine (Para-oxyphenyl-ethylamine).—*Chem. and Drug.,* 1912, v. 80, p. 523.

FORMICIN is described as formaldehyde-acetamide. It occurs as a slightly yellowish, thick, syrupy liquid, having a faint, formaldehyde-like odor and a slightly acid, bitter taste. Formicin is soluble in water, alcohol, chloroform and glycerin; it is nearly insoluble in ether. An aqueous solution of formicin (1 to 10) has an acid reaction on litmus.

Solutions of formicin liberate formaldehyde gradually at body temperature, and thus exert an antiseptic action. It is said to be non-toxic and 5 per cent. solutions are said to produce but little irritation. It has been used as injections for tuberculous joints and also as a wash for the disinfection of the skin and hands.—*J. Am. Med. Ass.,* 1912, v. 58, p. 1014.

FUCHSIN.—May, Eugene S., discusses the germicidal action of basic fuchsin and concludes that as a germicidal agent this substance is more powerful than phenol, has a greater diffusibility and is less toxic.—*J. Am. M. Ass.,* 1912, v. 58, pp. 1174–1176.

HEXAMETHYLENAMINE.—The editor of the therapeutics column (*J. Am. M. Ass.,* 1912, v. 58, pp. 1195–1197) discusses the physiologic and therapeutic action of hexamethylenamine and points out that at the present time it is sold under various proprietary names, such as urotropin, uratone, formin, aminoform, hexamin, cystamin, cystogen, etc. The editor also asserts that while a number of compounds of hexamethylentertramine have been marketed these have not been shown to be of any greater value or to liberate any greater amount of formaldehyde than the straight hexamenthylenamine.

IODO-CASEIN.—Iodo-casein is a compound of iodine with milk casein, containing about 18 per cent. of iodine in organic combination. It occurs as a yellowish-brown powder, almost odorless and tasteless, insoluble in water or acid solutions. It is partially dissolved and decomposed by alkalies.

Iodine-casein is said to undergo practically no change in the stomach, but to be quickly digested and absorbed in the form of soluble iodides in the intestines. It is claimed that it may be used to advantage as a substitute for the inorganic iodides, as it is said to be less disturbing in its effect on the digestive organs.—*J. Am. Med. Ass.*, 1912, v. 58, pp. 1014–1015.

NOVIFORM is bismuth tetrabrompyrocatechin and is to be regarded as an improved xeroform, in which the phenol group is replaced by the pyrocatechin group.—*Chem. and Drug.,* 1910, v. 80, p. 580.

OPIUM.—Xrayser II points out that the name "Thebaine" recalls the fact that Egypt was formerly a chief source of opium, which for that reason acquired the names "Theban drug" and "the Thebaic extract."—*Chem. and Drug.,* 1912, v. 80, p. 543.

OPIUM CONFERENCE.—An editorial (*Pharm. Ztg.*, 1912, v. 57, p. 194) reproduces the conclusions of the International Opium Conference and a second editorial (*Ibid.,* p. 227) comments on some of the difficulties that will be encountered in endeavoring to put the several conclusions into effect.

PEPSIN.—Walter, J. C., finds that pepsin is now but seldom prescribed in England, as it seems to have got into disrepute with the faculty. He thinks that any increase in the amount of pepsin made and sold must be due to its popular use in the form of "digestive tablets" and other specialties put up by the pharmacist.—*Brit. and Col. Drug.,* 1912, v. 61, p. 249.

PHENACETIN, SULPHONAL AND TRIONAL.—A report of the Committee on Patents and Trademarks of the Council on Pharmacy and Chemistry discusses the validity of the claims for proprietary rights in the names "Phenacetin," "Sulphonal," and "Trional," concludes that these names have become generic designations for the several products to which they have been applied, as synonyms for the official titles for "acetphenetidin," "sulphonmethane" and "sulphonethylemethane" respectively and that the tests of identity and purity described in the U.S.P. should apply to products when dispensed under these several titles.—*J. Am. M. Ass.*, 1912, v 58, pp. 1298–1299.

SULPHONAL.—An editorial (*Chem. and Drug.*, 1912, v. 80, pp.

401–409) comments on the proposed revision of the schedule of poisons and the inclusion of "sulphonal, its derivatives, and poisonous derivatives of mercaptol," and of "di-ethyl barbituric acid and other derivatives of barbituric acid, all poisonous ureides and their derivatives," and points out that this comprehensive definition will include practically all of the now available hypnotics.

The British Medical Journal, in commenting on the suggestion that sulphonal be made subject to the restrictions placed on poisons in Part I of the poison schedule, points out that if sulphonal were to be placed in Part I, with strychnine, corrosive sublimate, prussic acid, and other powerful poisons, there could be no reason for not adding many other substances to the same part; and one effect would be very likely to be that the restrictions on the sale of these dangerous substances, being applied equally to many less dangerous ones, would carry much less weight as precautionary measures than they do at present.—*Pharm. J.,* 1912, v. 88, p. 313.

Proferrin.—Proferrin is described as a compound of iron and milk casein, containing iron equivalent to about 10 per cent. elementary iron and phosphorus equivalent to about 0.5 per cent. of elementary phosphorus. It is prepared by treating an alkaline solution of casein with a solution of an iron salt and precipitating with acetic acid. Proferrin is a brown powder, almost odorless and tasteless, insoluble in water and dilute acids, slowly soluble in alkalies. It is recommended as a ferruginous tonic and may be given in doses of from 0.13 to 0.3 Gm.—*J. Am. M. Ass.,* 1912, v. 58, p. 1356.

Quinine.—A news note (*Oil, Paint and Drug Reporter,* 1912, v. 81, May 6, p. 34) comments on the consumption of quinine and cinchona in the United States, and points out that despite the increase of population there has been no marked increase in the importation of these drugs during the past 25 years. In 1882 the imports of quinine and the various salts of quinine amounted to 795,000 ounces; in 1884, 1,500,000 ounces; in 1892, 2,800,000 ounces; in 1906, 4,750,000; in 1911, 3,750,000. The figures for the current year would indicate an importation of about 3,000,000 ounces in the 12 months ending with June. The importations of Peruvian bark in 1882 exceeded 5,000,000 pounds; in the fiscal year 1911 the total imports were 3,826,000 pounds.

Santalyl Lactate.—U. S. patent No. 1,007,587 describes the preparation of a lactic ester of santalol by heating together santalwood oil and lactic acid, specific gravity 1.200. The resulting ester boils at 250°–260° under a pressure of 380 mm., and has a specific gravity 1.030–1.040. It is stated to be preferable to santalol for medicinal purposes.—*Chem. and Drug.*, 1912, v. 80, p. 523.

METHYOXYMETHYL-SANTALOL.—Methyoxymethyl-santalol, a liquid boiling at 152°–158° at 4 mm. pressure, is described in German patent 242,421 as being prepared by dissolving 220 Gm. of santolol in toluene with 212 Gm. of dimethylaniline and an excess of chloromethyl-ether. After standing for 24 hours the toluene is distilled off in vacuo and the residue is fractionated.—*Chem. and Drug.*, 1912, v. 80, p. 580.

SANTONIN.—Umney, John C., reports finding santonin adulterated with from 20 to 25 per cent. of acetanilide. The presence of acetanilide can, of course, be determined by the melting point, the mixture of the two bodies melting over a very wide range, and also by the fact that the acetanilide is comparatively soluble in hot water, from which it crystallizes on cooling. The adulteration is believed to have been made in Hamburg.—*Pharm. J.*, 1912, v. 88, p. 379.

Xrayser II, discussing the recently observed adulteration of santonin, asserts that this appears to be a pretty old story. Santonica itself used to be adulterated with tansy-seeds.—*Chem. and Drug.*, 1912, v. 80, p. 543.

SARSAPARILLA.—The editor of the Therapeutics Column (*J. Am. M. Ass.*, 1912, v. 58, pp. 1356–1357) discusses the absurdity of sarsaparilla, points out that sarsaparilla has no local action and that internally it is practically devoid of any physiological action whatever. The fact that the drug (if it deserves the name) is almost never used alone and that it is always combined with something more active, such as potassium iodide, renders even a concealed activity and value doubtful. The editor concludes by suggesting that the Pharmacopœia be purged of such absolute nonsense, if it is to continue to enjoy its own self-respect.

STORAX.—Hill and Cocking report the examination of 7 samples of "prepared storax"; the acid value ranged from 58.3 to 113.1, the ester value from 91.3 to 145.9, the saponification value from 194.6 to 205.9, and the total cinnamic acid content from less than 5 per cent. to 31.68 per cent. They suggest a number of modifications in the assay process for this drug, and state that the wide variation in the total cinnamic acid content exhibited in imported storax is indicated in the aroma and reflected in the market price.—*Chem. and Drug.*, 1912, v. 80, p. 412.

TYRAMINE.—Tyramine is para-hydroxy-phenyl-ethyl-amine hydrochloride, the hydrochloride of the base para-hydroxy-phenyl-amine, obtained synthetically. It occurs as an almost white, crystalline powder, easily soluble in water, forming a neutral solution. Taken internally or injected subcutaneously tyramine increases the blood pressure, its action being similar to epinephrine but weaker and slower and lasting longer. It is injected subcutaneously in doses of 0.02 Gm. dissolved in water.—*J. Am. M. Ass.*, 1912, v. 58, p. 1356.

VERONICA ANTHELMINTICA.—Bhaduri, K. (*Proc. Chem. Soc.*, No. 398, 1912, 53) has given the name *shomerajin* to a glucoside obtained from the seeds of Veronica Anthelmintica. He also reports finding that the oil of the seeds has a specific gravity at 25° of 0.9731; iodine value 91.7, and saponification value 305.7.—*Pharm. J.*, 1912, v. 88, p. 511.

ZEBRONAL.—Zebronal is described as dibrom-cinnamic ethyl ester, and is marketed as a remedy for epileptic troubles. It is insoluble in water, but soluble in alcohol. It contains 45 per cent. of bromine.—*Chem. and Drug.*, 1912, v. 80, p. 523.

PHILADELPHIA COLLEGE OF PHARMACY.

The ninety-first annual commencement of the Philadelphia College of Pharmacy was held in the American Academy of Music on Thursday evening, May 23d. After prayer by the Rev. I. I. Joyce Moore, the degrees were conferred by President Howard B. French.

The degree of Master in Pharmacy (Ph.M.)—*honoris causa*—was conferred upon each of the following: Benjamin Thomas Fairchild, Ph.G., Ewen McIntyre, Ph.G., Frank Gibbs Ryan, Ph.G., Freeman Preston Stroup, Ph.G., Lucius Leedom Walton, Ph.G.

The following are the names of those who received the degree of Doctor in Pharmacy (P.D.), together with the subjects of their graduating theses:

Name	Thesis	
Anderson, Walter Marion	*Commercial Gelatin*	Ohio
Arledge, Isaac Curtis	*The Influence of Moulds on Nux Vomica*	North Carolina
Armstrong, John James	*Coptis Trifolii*	Pennsylvania
Arnold, Mark Alphonsus	*Cocaine*	Pennsylvania

Name	Thesis	
Baldwin, Frank D.	*Soluble Milkweed Cellulose*	Pennsylvania
Blankenbush, Bernard Evered	*Action of Aloin on Alkaloids*	Pennsylvania
Bongartz, Joseph Theodore, [Ph.G.]	*The Dispensing Physician and the Prescribing Pharmacist*	New York
Boyer, Wesley Ray	*Liquor Arseni et Hydrargyri Iodidi*	Pennsylvania
Bradley, James Andrew	*Pastes*	New Jersey
Brenneman, Albert Sipe	*Aromatic Oil Sprays*	Pennsylvania
Brewster, Angus Eugene, [Ph.G.]	*The Refining of Raw Sugar*	Georgia
Buohl, Charles Augustus	*India Rubber*	New Jersey
Caton, Joseph Vester	*Acidum Tannicum*	North Carolina
Colborn, Earl Wesley	*Pepsin Chewing Gum*	Pennsylvania
Cone, Charles Gray	*Opium and Its Preparations*	Pennsylvania
Cooper, Joseph Benton	*Toilet Waters*	North Carolina
Coulbourn, Frederic Bennam	*Rice Powders*	Pennsylvania
Cox, Carl Reed	*Acidum Aceticum*	Pennsylvania
Davies, Emlyn	*Petroxes*	Pennsylvania
Dolbey, J. Warren	*Magma Bismuthi*	Pennsylvania
Durbin, Edward John	*Rheum*	Pennsylvania
Durkin, William Joseph	*Tincture of Iodine*	Pennsylvania
Ebischbach, Arthur	*Powdered Extract of Licorice*	Pennsylvania
Emig, Charles Maurice	*Tablet Manufacturing*	Pennsylvania
Enberg, Charles Elmer	*Physiological Salt Solution*	Pennsylvania
Eppler, Erwin Henry	*Saponin*	Pennsylvania
Epstein, William	*Physiological Standardization of Digitalis*	Pennsylvania
Estep, Fred Howard	*Fluidglycerates of Rhus Glabra, Rhubarb and Krameria*	Pennsylvania
Fair, Walter Terpe	*Acidum Sulphuricum Aromaticum*	Pennsylvania
Fetters, Miss Leonora Gibb	*Comparative Studies in the Histology of Aconite*	Pennsylvania
Finkelstein, Nathan	*Chloral Alcoholate in Prescriptions*	North Carolina
Foust, John Clark	*Ipecacuanha*	Pennsylvania
Foust, Samuel Byers	*Potassium Nitrate*	Pennsylvania
Fox, Clarence	*Hydrastine*	Pennsylvania
Gallagher, Malcolm Wight	*Mercury with Chalk*	Maine
Gates, Lynn Hubbell	*Hydrargyrum Ammoniatum*	Pennsylvania
Gensler, Howard Elias	*Analysis of Pepsin Chewing Gums*	Pennsylvania
Glover, Wallace Thompson	*Manufacture of Iron from Mill Cinder*	Pennsylvania
Goldblum, Theodore Isadore	*Hydrogen Peroxide*	Pennsylvania
Graeff, William Lewis, [P.C.]	*Desiccated Thyroid Glands*	Pennsylvania

Name	Thesis	
Griesemer, Lloyd Philip	*Solution of Potassium Arsenite.*	Pennsylvania
Griffiths, Ivor	*Simplified Show Card Writing.*	Pennsylvania
Hart, William Mathues	*Liquor Antisepticus U. S. P.*	Pennsylvania
Hartman, Allen K.	*Ammonii Chloridum*	Pennsylvania
Heart, Charles Russel	*History of Bees and Honey*	Pennsylvania
Hedges, Francis Xavier, [P.C.]	*Tragacanth and Indian Gum*	Pennsylvania
Heller, Theodore Rhinehart	*Hypophosphorous Acid*	Pennsylvania
Henning, Edward Francis	*Ginger*	Maryland
Hessler, Elmer Hunsberger	*Solutions of Hydrogen Dioxide.*	Pennsylvania
Hillegas, LeRoy Agnew Kern	*Advertising and Conducting a Retail Drug Store*	Pennsylvania
Hitzelberger, Walter Frederick	*Potassii Iodidum*	New York
Huber, Donald Witherow	*Elixir of Iron, Quinine and Strychnine Phosphates*	Pennsylvania
Humphrey, Harry Herbert	*Asphaltum*	Pennsylvania
Hunter, Edward Lee	*Pancreatin*	Pennsylvania
Ischler, George Herman	*Pyoxylin and Its U. S. P. Derivatives*	Pennsylvania
Jacobs, Sinclair Sartorious, [P.C.]	*Some Points of Difference Between Gum and Wood Turpentine*	Georgia
Jerger, Jr., Louis Henry	*Acidum Benzoicum*	Georgia
Keene, Elmer George	*Fermentation*	Pennsylvania
Keener, Carl Franklin	*A Preparation of the Chlorides of Iron, Mercury, Quinine and Arsenic*	Maryland
Keiser, Max	*Ointment of Zinc Oxide*	Russia
Kern, Stanley Atkins	*Olive Oil*	Pennsylvania
Knauf, Melvin Sterner	*Medicinal Plants Indigenous to This Community*	Pennsylvania
Kraus, Jacob William	*Ginseng*	Pennsylvania
Lawrence, Harry Dittmar	*Cod Liver Oil*	Pennsylvania
Leaphart, Harry Landis	*Standard Solution of Caramel*	Pennsylvania
Leech, Gordon	*The Histology of Podophyllum*	Pennsylvania
Lehman, Albert A.	*Diluted Hydriodic Acid*	Pennsylvania
Leidich, Percy Landis	*Perfumes in Cosmetics*	Pennsylvania
Lewis, Albert Morgan	*Aloes*	Pennsylvania
Litsch, George Mathias	*Solution of Magnesium Citrate*	Pennsylvania
Lofland, William Frederic	*The Menhaden Fishing Industry*	Delaware
Luedecke, Ernest	*Ferrum Reductum*	Pennsylvania
McGinty, James Michael	*Potassium Bromide*	Pennsylvania
Machesney, Ray Henney	*Tinctura Myrrhae*	Pennsylvania
Mattson, Hugh Leo Ignatius	*Potassii Iodidum*	Pennsylvania
Mayerberg, Emil Rosenthal	*Sodium Perborate*	North Carolina

Name	Thesis	
Meyer, Walter William	*Liquid Toilet Soap*	Indiana
Miller, Clayton Franklin	*Aurantii Dulcis Cortex*	Pennsylvania
Moon, Clarence Donald	*India Rubber and Vulcanite*	Pennsylvania
Mullen, James Scanlan	*Linum*	Pennsylvania
Mulloy, William Alsobrook	*Betel Nut*	South Carolina
Myers, Theodore McCloskey	*Olive Oil*	Pennsylvania
Pancoast, Ambrose	*Pills of Ferrous Iodide*	New Jersey
Parks, James Edward	*Tannic Acid*	Pennsylvania
Peterson, William James, [Ph.G.]	*Belladonna Grown in California*	California
Poffenberger, Howard Lee	*Efficiency of Tests for Formaldehyde in Milk*	Maryland
Powell, Louis	*Empty Gelatin Capsules*	Pennsylvania
Prickitt, Eldridge Hancock	*The Manufacture of Ice*	New Jersey
Randolph, Tucker Lucas	*Spiritus Aetheris Nitrosi*	Florida
Riley, John Arthur	*Starch Test Solution*	Montana
Robinson, Peale Dillard	*Myrrh and Its Preparations*	Maryland
Rumsey, Blair Grier	*The Practical Cost of Manufacturing*	Pennsylvania
Rupert, John Ralph	*Label Varnish*	Pennsylvania
Rusch, Sylvester James	*Benzoin*	Pennsylvania
Saylor, John Adam	*Liquor Ferri Iodidi*	Pennsylvania
Schersten, Hilbert Julius	*Peroxide Cold Creams*	Pennsylvania
Shtofman, Jacob	*Silica and Its Compounds*	Delaware
Sisman, Morris	*Commercial Cold Creams*	Pennsylvania
Skinner, William James	*Spirit of Nitrous Ether as Found on the Market*	North Carolina
Smiler, Nathan Norman	*Circulatory Displacement*	Pennsylvania
Smith, Milton Lovett	*Enteric Capsules*	Pennsylvania
Smith, Robert Alfred	*Advice to Graduates*	Pennsylvania
Stadelmann, Alfred George	*Grape Juice*	New York
Stauffer, Wilford Gilbert	*Acidum Nitricum Dilutum*	Pennsylvania
Stein, Samuel	*Rolling Creams*	Pennsylvania
Stover, Fred Hersman	*The Gastro-Pancreatic Ferments*	Alabama
Strunk, William Elwood	*Official Glandular Extracts*	Pennsylvania
Taylor, Miss Alice Williams	*Serpentaria*	Pennsylvania
Thompson, James DeWitt	*Production of Gasoline from Natural Gas*	Pennsylvania
Timm, Miss Clara Louise	*Proposed New Formulas of the N. F.*	Pennsylvania
Venner, Frank Atman	*The Manufacture of Toothpaste by the Retail Pharmacist*	New Jersey
Wagner, Otto Gross	*Tinctura Ferri Chloridi*	Pennsylvania
Warner, Clarence Gardiner	*Sodium Nitrate*	Pennsylvania
Warner, Harry Edwin	*Opium*	Pennsylvania

Name	Thesis	
Watts, Glenn Leland	*Sterilization*	New York
Weller, John Robert	*Diluted Sulphuric Acid*	Pennsylvania
Phila College of Pharmacy		
Wilderman, Hirsh	*Serum Antidiphthericum*	Russia
Woolsey, Howard Jones	*Linseed Oil and Pigments*	Pennsylvania
Wurster, Eugene John	*Vanilla and Its Importance in Pharmacy*	Ohio

The following are the names of those who received the degree of Pharmaceutical Chemist (P.C.), together with the subjects of their theses:

Name	Thesis	
Duvoisin, Miss Agnes	*Plasters and Their Spreading.*	Pennsylvania
Geiger, Joseph Hess	*Chloroform*	Pennsylvania
Hewitt, James VanSant	*Pill Excipients*	New Jersey
Hutchins, Parker Isaiah	*Preserving Chlorine Compounds*	Massachusetts
Infante, Antonio L.	*Wild Guira*	Cuba
Koch, Howard Jonathan	*Liquid Soap*	Pennsylvania
Lenhart, Clarence Milton	*Liquid Soap*	Pennsylvania
Perrine, Norman	*Crystallography*	New Jersey
Rodgers, Raymond Hamilton	*Fluidglycerates*	Pennsylvania
Weiler, Jr., John Fogel	*Koumyss*	Pennsylvania

The following students received certificates of Proficiency in Chemistry:

Fry, Eugene Arthur	Ohio
Kenney, Edward Francis	Maine
Strauch, Robert, [P.D.]	Pennsylvania
Teisen, Miss Aase	Pennsylvania
Wagner, Charles Louis	Pennsylvania

The address to the graduating class was made by Samuel W. Pennypacker, Esq., a former Governor of the Commonwealth of Pennsylvania.

AWARD OF PRIZES.

The Martin Cup, awarded to a graduating class obtaining a higher average than the one immediately preceding it, was awarded to the class of 1912. The Wellcome Cup, which is awarded to the second year class having the highest general average, was awarded to the second year class of the session of 1911–1912.

The following students of the graduating class received the grade of distinguished: Walter T. Fair and Elmer H. Hessler. The grade of meritorious was attained by Frederic B. Coulbourn, William J. Durkin, Howard E. Gensler and John A. Riley.

The Procter Prize, a gold medal and certificate, for the highest general average of the Class with a meritorious thesis, was awarded to Elmer H. Hessler, the presentation being made by President French.

The William B. Webb Memorial Prize, a gold medal and certificate, offered for the highest general average in the branches of Committee, Operative Pharmacy and Specimens, was awarded to Elmer H. Hessler, the presentation being made by Mr. Walter A. Rumsey. The following graduate receiving honorable mention in connection therewith: Frederic B. Coulbourn.

The Pharmacy Prize, a gold medal, offered by Prof. Joseph P. Remington, for original pharmaceutical work, was awarded to Charles M. Emig. The following graduates receiving honorable mention in connection therewith: Agnes Duvoisin and Ray H. Machesney.

The Chemistry Prize, $25, offered by Prof. Samuel P. Sadtler, for knowledge of Quantitative Chemical Analysis, was awarded to Elmer H. Hessler. The following graduates received honorable mention in connection therewith: Angus E. Brewster and Lloyd P. Griesemer.

The Materia Medica Prize, $25, offered by Prof. Clement B. Lowe, for the best examination in Materia Medica and in the recognition of Materia Medica Specimens with a meritorious thesis, was awarded to William J. Durkin. The following graduates received honorable mention in connection therewith: Charles G. Cone, Joseph B. Cooper, Walter T. Fair, Elmer H. Hessler, John A. Riley, and Clara L. Timm.

The Microscopical Research Prize, a Compound Microscope, offered by Prof. Henry Kraemer, for the most meritorious thesis involving original microscopic work, was awarded to Isaac C. Arledge. The following graduates received honorable mention in connection therewith: Frederic B. Coulbourn, Lenora G. Fetters, John C. Foust, Edward F. Henning, Jacob W. Kraus, Gordon Leech, Alice W. Taylor, and John F. Weiler, Jr.

The Analytical Chemistry Prize, $25, offered by Prof. Frank X. Moerk, for the best work in qualitative and quantitative analysis, was awarded to Elmer H. Hessler. The following graduates received honorable mention in connection therewith: William J. Durkin, Howard E. Gensler, Lloyd P. Griesemer, and Parker I. Hutchins.

The Operative Pharmacy Prize, $20 in gold, offered by Prof. Joseph P. Remington, for the best examination in Operative Pharmacy, was awarded to Agnes Duvoisin, the presentation being made by Dr. E. Fullerton Cook. The following graduates received honorable mention in connection therewith: Bernard E. Blankenbush, Albert S. Brenneman, William M. Hart, Elmer H. Hessler, Walter F. Hitzelberger, Elmer G. Keene, William F. Lofland, Ambrose Pancoast, Howard L. Poffenberger, and Clara L. Timm.

The Maisch Pharmacognosy Prize, $20 in gold, established by the late Jacob H. Redsecker, of Lebanon, Pa., and continued as a memorial by his nephew Jacob Redsecker Beetem, for Histological Knowledge of Drugs, was awarded to Isaac C. Arledge, the presentation being made by Mr. Clayton F. Shoemaker. The following graduates received honorable mention in connection therewith: William J. Durkin, Elmer H. Hessler, Alice W. Taylor, and Clara L. Timm.

The Maisch Botany Prize, $20, offered by Mr. Joseph Jacobs, of Atlanta, Ga., for the best Herbarium Collection of Plants, was awarded to Agnes Duvoisin, the presentation being made by Dr. A. W. Miller.

The Mahlon N. Kline Theoretical Pharmacy Prize, a Troemner Agate Prescription Balance, for the best examination in Theory and Practice of Pharmacy, was awarded to Howard E. Gensler, the presentation being made by Mr. Joseph W. England. The following graduates received honorable mention in connection therewith: Bernard E. Blankenbush, Walter T. Fair, Elmer H. Hessler, Albert A. Lehman, John A. Riley, and Blair G. Rumsey.

The Commercial Training Prize, $20 in gold, offered by Prof. Joseph P. Remington, to the graduate who passed the best examination in Commercial Training at the final examination for the degree, was awarded to John A. Riley, the presentation being made by Mr. Joseph L. Lemberger. The following graduates received honorable mention in connection therewith: Walter T. Fair, Howard E. Gensler, Theodore I. Goldblum, Edward F. Henning, Jacob W. Kraus, William F. Lofland, Ambrose Pancoast, William J. Peterson, and John R. Rupert.

The Instructors' Prize, $20, offered by the instructors of the College for the highest term average in the branches of Pharmacy, Chemistry and Materia Medica, was awarded to Elmer H. Hessler, the presentation being made by Dr. Alfred Heineberg. The following graduates received honorable mention in connection therewith: Frederic B. Coulbourn, William J. Durkin, Erwin H. Eppler, Walter T. Fair, Howard E. Gensler, and John A. Riley.

The Pharmacy Quiz Prize, one year's membership in the American Pharmaceutical Association, offered by Prof. Charles H. LaWall, for the best term work in Theory and Practice of Pharmacy, was awarded to John A. Riley. The following graduates received honorable mention in connection therewith: William J. Durkin, Erwin H. Eppler, Howard E. Gensler, Elmer H. Hessler, Clara L. Timm, Wilford G. Stauffer, and John R. Weller.

The Kappa Psi Fraternity Prize, a gold medal, offered by the Eta Chapter of the Kappa Psi Fraternity, to the graduate making the highest general average during his or her Senior Year at the College, was awarded to Elmer H. Hessler, the presentation being made by Mr. Clayton F. Shoemaker, Jr. The following graduates received honorable mention in connection therewith: Frederic B. Coulbourn, William J. Durkin, Walter T. Fair, Howard E. Gensler, and John A. Riley.

The Public Lecture Report Prize, $10 in gold, awarded for the best written report of the series of ten public lectures held under the auspices of the Philadelphia College of Pharmacy, was awarded to Elmer H. Hessler, the presentation being made by Prof. Chas. H. LaWall.

PHARMACEUTICAL MEETING.

The last of the Pharmaceutical meetings for the session of 1911–1912 was held on Wednesday, May 22d, with Professor Kraemer in the chair. The meeting was devoted to the consideration of the graduating theses of a number of the students, who presented abstracts of their work and illustrated their studies with specimens, drawings and black-board illustrations. The following students participated in the symposium: Isaac C. Arledge, Howard E. Gensler, Agnes Duvoisin, Blair G. Rumsey, Charles E. Enberg, William J. Durkin, J. Warren Dolbey and I. Griffiths.

As this is the time designated in the By-Laws of the College for the election of a Recorder for the meetings of 1912–1913, Dr. George B. Weideman was unanimously elected to this position.

Mr. Paul H. McConomy presented several pieces of pharmaceutical apparatus which were used by Mr. Robert C. Brodie, fifty years ago. They included a plaster iron such as was used in the spread of plasters; a syringe; and a number of nursing bottles.

Prof. Kraemer exhibited some sliced corms of *Colchicum Bornmuelleri*, an enormous cormous plant imported by Prof. J. O. Schlotterbeck, of the University of Michigan. He also showed a specimen of silver leaf, sent him by David J. Reese. This is probably the leaf of the silver tree, *Leucadendron argenteum* R. Br.

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The coming meeting of the Pennsylvania Pharmaceutical Association promises to be one of the most important to the retail pharmacists of Pennsylvania in the history of the Association. The meeting will be held on June 18, 19 and 20, at Buena Vista Spring. The official program which has been issued by the Secretary is very attractive. In addition to the reports of committees and the reading of papers, there will be the consideration of a proposed pharmacy bill relating to (*a*) the practice of pharmacy and (*b*) the sale, prescription and possession of habit forming drugs. Space at this time permits us to print only the draft of the proposed act relating to the sale, prescription and possession of opium, etc., which is as follows:

AN ACT

Regulating the sale, prescription and possession of opium, morphine, heroin, codeine, their salts, derivatives or compounds; or any substance or preparation containing opium, morphine, heroin, codeine, their salts, derivatives or compounds; providing penalties for the violation thereof and providing for the enforcement of said law and providing an appropriation for the enforcement of said law.

SECTION 1. That it shall be unlawful for any person, firm, or corporation to sell furnish give away or deliver any opium morphine heroin codeine their salts derivatives or compounds or any substances or preparation containing opium heroin morphine codeine or their salts derivatives or compounds except upon the written prescription of a duly registered practitioner of medicine dentistry or veterinary medicine which prescription shall be filled out once and of which no copy shall be taken by anyone and which shall be retained and kept on file by the dispenser thereof for a period of at least five years and be open to inspection at all times by the prescriber and properly authorized officers of the law or the agents of the State Pharmaceutical Examining Board provided that any such prescription may be refilled upon the written order of the original prescriber.

Provided that the provisions of this section shall not apply to sales made by any manufacturer wholesale druggist or owner of a pharmacy to another manufacturer wholesale druggist or owner of a pharmacy or to hospitals colleges scientific or public institutions practitioners of medicine dentistry or veterinary medicine nor to the sale or dispensing of registered pharmacists of written prescriptions of registered physicians dentists or veterinarians if such prescriptions contain not more than two grains of opium or not more than one-fourth grain of morphine or not more than one-fourth grain of heroin or not more than three-fourths grain of codeine or not more of any salt or derivative of opium morphine heroin or codeine in the proportion herein named for the drug from which such salt or derivative is prepared in one fluid ounce or if a solid preparation in one troy ounce nor to the sale or dispensing of prescriptions for plasters liniments and ointments containing any drug or derivative thereof herein named when prescribed for external use only nor to the sale of cough remedies proprietary medicines or other medicinal preparations provided they are sold as medicines and not for the purpose of evading the provisions of this act of Assembly or supplying habitues to the use of opium morphine heroin codeine their salts derivatives or preparations with any of these drugs if they contain not more than two grains of opium or not more than one-fourth grain of morphine or not more than one-fourth grain of heroin or not more than three-fourths grain of codeine or not more of any salt or derivative of opium morphine heroin or codeine in the proportion herein named for the drug from which such salt or derivative is prepared in one fluid ounce or if a solid preparation in one avoirdupois ounce and not more than one of the drugs or more than one of any salt or derivative of any drug herein named nor to the sale of plasters liniments and ointments containing any drug herein named when prepared and sold for external use only nor to the sale of paregoric brown mixture brown mixture tablets compound syrup of white pine Dewees' carminative Dalby's carminative Bateman's drops Godfrey's cordial Dover's powder sun cholera mixture Squibb's diarrhœa mixture or Warburg's tincture nor to the sale of any compound mixture or preparation into which any drug or any derivative of any drug named in this section of this act of Assembly may enter provided such compound mixture or preparation contains sufficient of another ingredient or other ingredients as to render it unfit for use by an habitual user of any drug or drugs to which this act of Assembly applies.

And provided also that before delivering any of the articles or within twenty-four hours thereafter there shall be made in a book kept for the purpose an entry of the sale thereof stating the date of sale the quantity name and form in which sold the name and address of the purchaser and whether said purchaser is a wholesale druggist or owner of a pharmacy manufacturer physician dentist or veterinarian and the said book shall be always open for inspection by the proper authorities and shall be preserved for a period of five years after the last entry therein.

And further it shall be the duty of all dealers in drugs and manufacturers to make monthly reports to the State Pharmaceutical Examining Board of their sales of all articles to which this act of Assembly applies excepting articles sold or dispensed upon prescription of a registered practitioner of medicine dentistry or veterinary medicine in such form as may be required and upon blanks to be provided by said State Pharmaceutical Examining Board. It shall be the duty also of every practitioner of medicine who prescribes or administers any of the drugs to which this act of Assembly applies for the use of any person known to him as an habitual user of any such drugs to keep a record of the name age and address of the person the name and quantity of the drug so prescribed or administered and report the same in monthly reports to the State Pharmaceutical Examining Board.

SECTION 2 That no practitioner of medicine dentistry or veterinary medicine shall prescribe opium morphine codeine heroin their salts compounds derivatives or preparations for the use of any person known to him as an habitual user of the same nor shall any practitioner of dentistry prescribe any of the foregoing substances for any person not under his treatment in the regular practice of his profession nor shall any practitioner of veterinary medicine prescribe any of the foregoing substances for the use of any human being provided however that the provisions of this Act of Assembly shall not be construed to prevent any duly registered practitioner of medicine from administering to any person or prescribing in good faith for the use of any habitual user of narcotic drugs who is under his professional care such substances as he may deem necessary for his treatment when the same are not administered or prescribed for the purpose of evading the provisions of this act of Assembly or perpetuating the habitual use of any of the articles subject to the provisions of this act of Assembly by any habitual user thereof.

SECTION 3 That it shall be unlawful for any person firm or corporation to sell furnish give away or deliver any proprietary or patent medicine containing opium morphine heroin codeine or their salts derivatives or compounds which is advertised or recommended as a remedy for administration to infants.

SECTION 4 That any person who shall violate any of the provisions of this act of Assembly shall be guilty of a misdemeanor and for each offense upon conviction thereof shall be sentenced to pay a fine of not more than five hundred ($500.00) dollars and undergo an imprisonment of not more than two years in the county prison or either or both at the discretion of the court.

SECTION 5 That it will be unlawful for any person who is not a practicing physician dentist or veterinarian or manufacturing chemist or manufacturing pharmacist or wholesale druggist or owner of a pharmacy or manufacturer of proprietary or patent medicine to have in his possession any opium morphine heroin codeine or their salt derivatives or compounds or any patent or proprietary medicine containing opium morphine heroin codeine or their salts derivatives or compounds in such form or quantity as to make the same subject to the provisions of this act of Assembly except by reason of a prescription of a registered practitioner of medicine dentistry or veterinary medicine and any person violating the provisions of this section of this act of Assembly shall be guilty of a misdemeanor and upon conviction thereof be sentenced to pay a fine of not more than fifty ($50.00) and undergo an imprisonment of not more than six months or either or both at the discretion of the court.

SECTION 6 That it shall be the duty of the State Pharmaceutical Examining Board to enforce the provisions of this Act, who shall receive as compensation for their services the same per diem and expenses that they receive as members of the State Pharmaceutical Examining Board, under authority of law, and who shall also have power to employ such agents, chemists and assistants as may be necessary to enforce the provisions hereof.

SECTION 7. That the sum of fifty thousand dollars, or so much thereof as may be necessary, be, and hereby is, appropriated for enforcing the provisions of this act, to be paid out of the State treasury upon warrants duly signed and approved by the president and secretary of the State Pharmaceutical Examining Board.

SECTION 8 The provisions of this act shall not apply to the sale of any patent or proprietary remedy containing opium, morphine, heroin, codeine or any salt, derivative, compound or preparation of the same by any dealer, which were in such dealer's stock, in this State, at the time of approval of this act: Provided, that the package, or other container in which the remedy shall be contained, shall be plainly and distinctly marked "On Hand"—(date of approval).

SECTION 9 That all acts and parts of acts inconsistent herewith, be, and hereby are repealed.

NEWS ITEM.

THE CENTENARY OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA was celebrated on March 19–21 with befitting exercises. Among the early members and founders of the Society were a number of Apothecaries of Philadelphia. At first they met once a week in their own homes, inviting scientists to address them. They then hired a small room, later acquired a building and soon began to attract physicians, teachers and scientists to their meetings. To-day the Academy has a large modern building covering half a city block, collections that compare favorably with the best of our museums, a reference library of 60,000 volumes, and is engaged in scientific and educational work that reflects credit upon its members.

THE AMERICAN
JOURNAL OF PHARMACY

JULY, 1912

A NOTE ON THE ASSAY OF THE ORGANIC SALTS OF POTASSIUM AND SODIUM IN THE U. S. PHARMACOPŒIA.

By Elias Elvove.
Hygienic Laboratory, U. S. Public Health and Marine-Hospital Service, Washington, D. C.

As is well known, the U. S. Pharmacopœia requires an assay method for the organic salts of potassium and sodium [1] which involves carbonization, extraction of the residue with boiling distilled water until the washings cease to react with methyl orange, and the subsequent titration of the filtrate by means of standard acid. But it has been shown by Seidell and Wilbert,[2] in the case of sodium benzoate, "that even in spite of the greatest care the unburned carbon left after the extraction of the incinerated residue retains an appreciable amount of alkali, and therefore in order to obtain satisfactory results it is necessary to make a second ignition of this unburned and extracted carbon, and add the solution of the second residue to that of the first, before making the titration for the total alkali." They therefore recommend a modified procedure in which the sample "is ignited thoroughly in a platinum dish," the residue extracted with hot water and the solution filtered through an ashless filter, the unburned carbon washed several times, and then returned together with the filter paper to the platinum dish and ignited. The second residue is dissolved in water and added to the filtered extract of the first residue and then titrated with standard acid.

Seidell and Wilbert report results on sodium benzoate only. But inasmuch as essentially the same quantitative test which the

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[1] U. S. Pharmacopœia (1905), pp. 355, 357, 360, 362, 395, 396–397, 402, 410.

[2] Amer. Jour. Pharm., **82**, 67–68 (1910).

U. S. P. requires in the case of sodium benzoate, is also required in the cases of other U. S. P. organic salts of potassium and sodium, their criticism of the U. S. P. method probably applies there equally well. However, it is to be noted that the U. S. P. cautions the operator with regard to the degree of heat which may be applied. Thus, in most instances, the U. S. P. directions are that the substance be "carbonized at a temperature not exceeding red heat," the reason for this probably being that otherwise loss may occur. As a matter of fact, loss was actually found to occur in the case of a sample of sodium benzoate even when ignited by means of an ordinary Bunsen burner, but having the platinum dish loosely covered with a piece of platinum foil. It appears necessary, therefore, that some other method be adopted if uniformly accurate results are to be obtained.

In this connection it occurred to the writer that probably a safer procedure might be based on the transformation of the potassium and sodium into their highly stable and non-volatile sulphates, which is a procedure often used in organic analysis, and a form of which is actually adopted by the present U. S. P. in the case of the organic salts of lithium. As a result of some preliminary experiments, with regard to the most suitable strength of sulphuric acid to use, the amount of excess of acid that is necessary and sufficient, and other conditions tending to eliminate spirting in the final operations, the following procedure was found to yield satisfactory results.

Mode of Procedure.

Portions of the various samples in powdered form, generally about 0.5 Gm. of each, were placed in platinum dishes (100 c.c.), dissolved in a sufficient amount of hot water, and treated with an amount of N/1 H_2SO_4 which was about a third or a half in excess of that theoretically required. In those cases where the solubility of the salts in the acid solution used was sufficient to finally yield a clear solution, the preliminary solution in hot water was omitted. In each case, the dish was then placed on a boiling water bath and the contents allowed to evaporate as much as possible. The dish was then covered with a piece of platinum foil and placed in a drying oven, the temperature of which was gradually increased from about 100° C. to about 150° C. Generally, it was allowed to remain in the drying oven for about 30 minutes. It was then ignited by means of a Bunsen burner while still loosely covered by the platinum foil, increasing the temperature gradually up to red heat, and continuing the ignition at red heat for 10–15 minutes. It was then cooled and weighed in the usual way and the ignition repeated for another interval of 10 minutes. Usually, the weight after the second ignition was practically the same as after the first; and hence the results obtained after the second ignition were usually accepted as final. That the first ignition had in most instances really effected the complete change was indicated also by the perfectly white color of the residue. Various samples of potassium acetate, potassium bitartrate, potassium citrate, potassium and sodium tartrate, sodium acetate, sodium benzoate, sodium citrate, and sodium salicylate, obtained from different American firms, were assayed by the above method. In the case of the potassium acetate, however, owing to its very deliquescent nature, the above procedure was slightly modified as follows: An amount of the sample, judged to be sufficient for the analysis, was quickly transferred into a comparatively wide weighing bottle, and weighed. The uncovered weighing bottle was then placed in a drying oven and allowed to remain there for one hour at 105° C. After cooling in a desiccator, its weight was again determined and the contents were transferred into the platinum dish with the aid of the N/1 H_2SO_4 and the weighing bottle was washed with distilled water, adding the washings to the contents of the dish. From this point the procedure was the same as in the other cases. The results obtained are given in the following tables:

TABLE I.

Showing Degree of Purity of Various Samples of Commercial Potassium Citrate, $K_3C_6H_5O_7+H_2O$.

No. of Sample	Amount Taken for Analysis	Weight of K_2SO_4 Found	Theory for K_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
5	0.5022	0.3933	0.4046	97.21
4	0.5015	0.3994	0.4040	98.86
8	0.5006	0.3989	0.4033	98.91
12	0.5008	0.3992	0.4034	98.96
11	0.5009	0.4004	0.4035	99.23
3	0.5000	0.4002	0.4028	99.35
2	0.5011	0.4012	0.4037	99.38
10	0.5032	0.4036	0.4054	99.56
9	0.5021	0.4031	0.4045	99.65
1	0.5028	0.4043	0.4051	99.80
7	0.5014	0.4037	0.4039	99.95

Table II.

Showing Degree of Purity of Various Samples of Commercial Potassium Bitartrate, $KHC_4H_4O_6$.

No. of Sample	Amount Taken for Analysis	Weight of K_2SO_4 Found	Theory for K_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
11	0.5018	0.2301	0.2322	99.10
2	0.5000	0.2302	0.2314	99.48
3	0.5009	0.2306	0.2318	99.48
4	0.5010	0.2309	0.2319	99.57
12	0.5002	0.2306	0.2315	99.61
5	0.5012	0.2329	0.2320	99.61*
10	0.5013	0.2313	0.2320	99.70
8	0.5025	0.2322	0.2326	99.83
9	0.5019	0.2321	0.2323	99.91
7	0.5016	0.2320	0.2321	99.96
1	0.5013	0.2321	0.2320	99.96*
6	0.5012	0.2320	0.2320	100.00

* The sign (*) by the side of any of the percentage figures, in this and the following tables, indicates that the sulphate found exceeded the theoretical 100 per cent. by as much as the figure in the table is less than 100 per cent.

Table III.

Showing Degree of Purity of Various Samples of Commercial Potassium Sodium Tartrate, $KNaC_4H_4O_6+4H_2O$.

No. of Sample	Amount Taken for Analysis	Weight of $K_2SO_4+Na_2SO_4$	Theory for $K_2SO_4+Na_2SO_4$	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
2	0.5035	0.2907	0.2821	96.96*
10	0.5011	0.2834	0.2807	99.04*
5	0.5013	0.2832	0.2808	99.15*
7	0.5011	0.2827	0.2807	99.29*
4	0.5035	0.2840	0.2821	99.33*
1	0.5022	0.2822	0.2813	99.68*
9	0.5010	0.2811	0.2807	99.86*
3	0.5028	0.2820	0.2817	99.89*
8	0.5029	0.2816	0.2817	99.96
6	0.5028	0.2816	0.2817	99.96

* See footnote to Table II.

TABLE IV.

Showing Degree of Purity of Various Samples of Commercial Potassium Acetate, $KC_2H_3O_2$.

No. of Sample	Amount Taken for Analysis	Loss on Drying at 105° for One Hour	Weight of K_2SO_4 Found	Theory for K_2SO_4†	Percentage Loss on Drying at 105° for One Hour	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	(*Gm.*)		
5	1.3810	0.0908	1.0412	1.1454	6.57	90.90
7	1.1640	0.0123	0.9473	1.0224	1.05	92.65
11	1.5545	0.0451	1.2505	1.3400	2.90	93.32
2	1.6206	0.1105	1.2513	1.3406	6.82	93.34
6	1.4194	0.0267	1.1902	1.2363	1.88	96.27
8	1.0180	0.0115	0.8810	0.8935	1.13	98.60
12	1.2257	0.0090	1.0674	1.0801	0.74	98.83
4	0.9911	0.0157	0.8597	0.8659	1.59	99.28
10	1.6336	0.0180	1.4258	1.4342	1.10	99.41
1	1.5622	0.0192	1.3626	1.3698	1.23	99.47
9	1.5973	0.0260	1.3876	1.3949	1.63	99.48
3	0.9461	0.0664	0.7796	0.7809	7.02	99.83

† Calculated on basis of the weight of the salt after drying.

TABLE V.

Showing Degree of Purity of Various Samples of Commercial Sodium Benzoate, $NaC_7H_5O_2$.

No. of Sample	Amount Taken for Analysis	Weight of Na_2SO_4 Found	Theory for Na_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
2	0.5000	0.2817	0.2465	85.72*
4	0.5000	0.2399	0.2465	97.33
8	0.5008	0.2405	0.2469	97.41
1	0.5000	0.2404	0.2465	97.53
10	0.5008	0.2410	0.2469	97.61
9	0.5007	0.2423	0.2468	98.18
7	0.5000	0.2428	0.2465	98.50
3	0.5000	0.2442	0.2465	99.07
5	0.5000	0.2442	0.2465	99.07

* See footnote to Table II.

TABLE VI.

Showing Degree of Purity of Various Samples of Commercial Sodium Citrate, $2Na_3C_6H_5O_7+11H_2O$.

No. of Sample	Amount Taken for Analysis	Weight of Na_2SO_4 Found	Theory for Na_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
11	0.5019	0.3573	0.2994	80.66*
8	0.5006	0.3266	0.2987	90.66*
5	0.5016	0.3166	0.2993	94.22*
2	0.5016	0.3036	0.2993	98.56*
1	0.5021	0.3022	0.2996	99.13*
4	0.5000	0.3005	0.2983	99.26*
7	0.5012	0.3010	0.2990	99.33*
3	0.5004	0.3002	0.2985	99.43*
10	0.5015	0.2982	0.2992	99.67
9	0.5015	0.2999	0.2992	99.77*

* See footnote to Table II.

TABLE VII.

Showing Degree of Purity of Various Samples of Commercial Sodium Salicylate, $NaC_7H_5O_3$.

No. of Sample	Amount Taken for Analysis	Weight of Na_2SO_4 Found	Theory for Na_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
2	0.5007	0.2133	0.2222	95.99
12	0.5007	0.2208	0.2222	99.37
1	0.5008	0.2211	0.2223	99.46
5	0.5001	0.2231	0.2219	99.46*
4	0.5016	0.2218	0.2226	99.64
9	0.5006	0.2228	0.2222	99.73*
3	0.5000	0.2214	0.2219	99.77
10	0.5000	0.2214	0.2219	99.77
7	0.5000	0.2224	0.2219	99.78*
8	0.5005	0.2221	0.2221	100.00

* See footnote to Table II.

TABLE VIII.

Showing Degree of Purity of Various Samples of Commercial Sodium Acetate, $NaC_2H_3O_2+3H_2O$.

No. of Sample	Amount Taken for Analysis	Weight of Na_2SO_4 Found	Theory for Na_2SO_4	Purity of Sample Expressed in Percentage
	(*Gm.*)	(*Gm.*)	(*Gm.*)	
9	0.5018	0.2640	0.2619	99.20*
11	0.5004	0.2594	0.2612	99.31
5	0.5015	0.2605	0.2618	99.50
6	0.5010	0.2603	0.2615	99.54
7	0.5010	0.2607	0.2615	99.69
8	0.5009	0.2607	0.2615	99.69
2	0.5010	0.2611	0.2615	99.85
3	0.5023	0.2626	0.2622	99.85*
4	0.5013	0.2620	0.2617	99.89*
12	0.5000	0.2608	0.2610	99.92
10	0.5005	0.2611	0.2613	99.93
1	0.5020	0.2621	0.2620	99.96*

* See footnote to Table II.

Seidell and Wilbert[3] found, in the case of sodium benzoate, that even when using their modification of the U. S. P. method, none of the samples which they examined complied with the U. S. P. purity requirement of "not less than 99 per cent." Their highest result, when using their modification, is 97.6 per cent.; and by the U. S. P. method, their highest result is only 94.7 per cent. This, therefore, opens up the question whether the percentage purity requirements, in the cases of the other U. S. P. organic salts of potassium and sodium, are not equally difficult to meet. The results given in the above tables are of interest, therefore, in showing how near an agreement there is between the U. S. P. purity requirements for these salts and the actual conditions of these salts on the American market, when assayed by the procedure above described.

The results given in Table I show that the greater number of the samples of potassium citrate examined complied with the U. S. P. requirement that the purity be not less than 99 per cent. Of the samples whose purity was found to be less than 99 per cent., the results in three cases (Nos. 4, 8, and 12) are so close to 99 per cent. that for all practical purposes it may be said that they, too, comply with the U. S. P. requirement. In other words, only one (No. 5) of the eleven samples of potassium citrate examined was found to be of a considerably lower purity than the U. S. P. requirement of 99 per cent. We may conclude, therefore, that the requirement of 99 per cent. is entirely reasonable and that the potassium citrate on the American market meets this requirement in nearly all the cases examined.

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[3] *Loc. cit.*

The results given in Table II show that the 12 samples of potassium bitartrate examined were all found to be of a very high degree of purity, the greater number showing a purity of over 99.5 per cent., and none were found to be of a lower purity than 99 per cent. The U. S. P. purity requirement of "not less than 99 per cent." must therefore be regarded as very reasonable.

The results given in Table III show that, of the 10 samples of potassium sodium tartrate examined, all but one were found to have a purity of over 99 per cent. The U. S. P. purity requirement for this salt of "not less than 99 per cent." is therefore reasonable; and it seems that nearly all of the potassium sodium tartrate on the American market complies with this U. S. P. requirement.

The results given in Table IV show that, of the 12 samples of potassium acetate examined, more than half were of a purity of over 98.5 per cent., calculated on the basis of the weight after drying at 105° C. for one hour. The U. S. P. requirement of a purity of not less than 98 per cent. must, therefore, be regarded as quite reasonable. However, it is to be noted that the present U. S. P. does not limit the amount of moisture which the salt may contain; and since this salt is very deliquescent, the amount of moisture which it may have absorbed may be very considerable. Thus, one sample (No. 3) was found to have lost over 7 per cent. of its weight when dried at 105° C. for one hour. It would seem desirable, therefore, that in the next revision of the U. S. P., the amount of moisture which may be present should be limited. The results given here show that, of the 12 samples examined, 8 of these lost less than 2 per cent. on drying at 105° C. for one hour. It would not be unreasonable, therefore, to expect that U. S. P. potassium acetate should not lose more than 2 per cent. of its weight on drying at 105° C. for one hour.

The results given in Table V show that only 2 of the 9 samples of sodium benzoate examined complied with the U. S. P. purity requirement of "not less than 99 per cent." It is seen, however, that about half of the samples examined showed a purity of over 98 per cent.; and with the exception of only one sample (No. 2), the found purity was in all cases quite close (within a fraction of a per cent.) to 98 per cent. It seems, therefore, that the purity of the greater portion of the sodium benzoate on the market is only about 98 per cent. This, however, cannot very well be attributed to habitual carelessness on the part of the manufacturers, since a number of the low results were obtained with the samples from manufacturers whose other salts, which were examined in this connection, were found to be of excellent purity. It is more likely, therefore, that the comparatively lower results in the case of the sodium benzoate are due to some technical difficulties met with in the manufacture of the salt on a large scale which cause the neutralization to be somewhat incomplete or lead to the absorption of some moisture. And since neither the presence of a small amount of moisture nor a very slight excess of the acid or alkali can reasonably be said to materially affect the usefulness of the salt for medicinal purposes, it is a question, therefore, whether a requirement of a minimum of 98 per cent. of the absolute salt, and a stipulation as to what the remaining 2 per cent. should consist of, would not really be preferable to the present U. S. P. requirement of 99 per cent., which seems to be a little too high for most of the manufacturers to meet.

The results given in Table VI show that, of the 10 samples of sodium citrate examined, more than half were of a purity of over 99 per cent. The acceptance by the present U. S. P. of a sodium citrate having a purity of only 97 per cent. seems, therefore, not warrantable by the actual conditions pertaining to the purity of this salt as found on the American market. With the exception of only 3 (Nos. 5, 8, and 11) of the samples examined, all were found to have a purity of over 98.5 per cent. If, therefore, the purity standard for this salt were increased from 97 per cent. to a minimum of 98.5 per cent., the change would certainly not be unreasonable and would serve to make the U. S. P. requirement more nearly in harmony with the comparatively very high purity of what seems to be the greater portion of the sodium citrate on the American market.

The results given in Table VII show that, of the 10 samples of sodium salicylate examined, 6 of these showed a purity of over 99.5 per cent. The present U. S. P. requirement of "not less than 99.5 per cent." is, therefore, not entirely unreasonable. As a minimum limit, however, 99.5 per cent. may be a trifle too high.

Thus, samples Nos. 5, 1, and 12, which showed a purity of 99.46, 99.46 and 99.37 per cent., respectively, might have to be rejected as not complying with the U. S. P. requirement, whereas, a slight deviation from perfect neutrality or presence of a small amount of moisture might easily account for those differences. It is a question, therefore, whether a requirement of not less than 99 per cent., with a statement as to what the remaining 1 per cent. should consist of, would not be sufficient and preferable.

The results given in Table VIII show that of the 12 samples of sodium acetate examined, 10 had a purity of 99.5 per cent. or over and all were over 99 per cent. pure. The statement in the present U. S. P.,[4] according to which a purity of not less than 99.5 per cent. is required for this salt when "in an uneffloresced condition" but not limiting the amount of efflorescence, seems objectionable. Since all of the samples examined showed a purity of over 99 per cent., a straight requirement of not less than 99 per cent., without any reference to efflorescence, would seem entirely reasonable and preferable to the requirement of the present U. S. P., which by the statement "in an uneffloresced condition" nullifies in a large measure the value of the test.

A NOTE ON TINCTURA CARDAMOMI COMPOSITA.

By John K. Thum, Ph.G.
Pharmacist at the German Hospital, Philadelphia.

The present pharmacopœial method for the preparation of compound tincture of cardamom possesses no advantages over the previous one when final results are considered. Of course in the present method, which is simply maceration and filtration,—and which is the German pharmacists' style for the manufacture of most of their galenicals—the disagreeable features involved in trying to percolate cinnamon and the other crude drugs contained in the preparation are avoided. Because of the pectin present in it cinnamon is extremely difficult to percolate with a menstruum of low alcoholic content; for this reason the present pharmacopœia recommends the method mentioned above. But, like the preparation made by percolation the tincture does not remain clear for any length of time. Filtration must be resorted to quite frequently to free it of a pectinous precipitate. To the busy pharmacist this is annoying in that it consumes time and labor. To obviate this we replace the cinnamon with the official spirit of cinnamon. As the spirit is made by dissolving the essential oil in alcohol we use just sufficient of it to approximate the amount of oil in the crude drug displaced. As this is generally regarded as about one per cent., we advise the use of 2.5 C.c. of the official spirit of cinnamon to the litre. The formula and method is as follows:

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[4] U. S. Pharmacopœia (1905), p. 394.

Tinctura Cardamomi Composita:

Cardamom	25.0 Gm.
Caraway	12.0 Gm.
Cochineal	5.0 Gm.
Spirits of cinnamon	2.5 C.c.
Glycerin	50.0 C.c.
Diluted alcohol, a sufficient quantity to make	1000.0 C.c.

Mix the cardamom, caraway, and cochineal, and reduce them to a moderately coarse powder (No. 40). Then moisten the powder with 25 cubic centimetres of diluted alcohol, pack it firmly in a cylindrical percolator, and gradually pour diluted alcohol upon it until 940 cubic centimetres are obtained; then add the spirit of cinnamon, glycerin, and sufficient of the weak percolate to make the required volume and mix.

CULTIVATION OF HYDRASTIS.

By J. L. Stingel, Cleveland School of Pharmacy.

The presumption that Hydrastis is practically extinct in many localities led the writer to undertake its cultivation under domesticated conditions. In order to secure plants it became necessary to search near-by forests. This I did in early spring as soon as the plants secured a sufficient growth to recognize them. In this way I was able to secure more plants than I was able to handle; in fact, was surprised at their number. These localities have been gone over frequently, later in the season, in previous years, but nothing of any consequence was ever found.

Cattle are a destructive factor with hydrastis, since the leaf stem makes a rapid growth and affords a delicious morsel. One can readily see what results follow when cattle are allowed access to forests containing this plant. The fruit and seed seldom mature in such localities. The increase in number of plants is brought about by formation of leaf buds on the roots, the latter of which are very abundant and assume a great length.

Cultivation.—The raising of this plant is not difficult. The condition in which it exists in its native haunts would undoubtedly be the one to follow, although this is not necessary. Shade is an important factor; one-third sunlight when artificial means (lattice work) is used gives good results.

This paper was not intended as an exhaustive study of the cultivation of Hydrastis, but to present a few views and experiences encountered while working with the drug. The writer recommends to those interested in its cultivation the reading of: Bull. Bur. Plant Ind., U. S. Dept. Agric., 1907, No. 107, The *Jr. Am. Pharm. Ass.*, 1912, ii, p. 5–12.

With the progress of civilization it is useless to assert that the number of plants is just as abundant as ever but will make the statement that there exists at the present time more Hydrastis than is usually thought to be the case, but if collected as in previous years regardless of season or preservation, etc., the plant will soon become extinct.

The scarcity of this valuable drug cannot be entirely attributed to lack of plants or extinction, but to other conditions, which tend to prevent identification at the time of collection. The only feasible solution to the present Hydrastis problem lies in cultivation.

KIESELGUHR.[1]

By Henry C. Blair.

No information is given in the books of reference used by pharmacists, except in Merck's Index, about this substance; a few manufacturers and teachers know of it and the name, Infusorial Earth, is applied to it by dealers and others, although it is incorrect.

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[1] Presented to the Pennsylvania Pharmaceutical Association, June, 1912.

The name Kieselguhr is German and literally translated means Silicious Marl. This marl is a deposit found in the dry basins of prehistoric lakes and seas, particularly in Lünberger Heide, in the vicinity of Berlin, Germany, and near Bilin in Bohemia. It consists of silicic covering of dead diatoms and upon incineration leaves a residue silicic anhydride SiO_2. Usually the natural deposit is calcined so as to destroy the organic matter, then floated and dried.

Kieselguhr is marketed of various kinds from the heavy, buff-colored kind to the very light, white kind, and varies in price according to the quality and inclination of the jobber. Of the various samples secured from jobbers in Philadelphia and New York during May, 1912, all but one were labelled Infusorial Earth, and under the microscope all but one show skeletons of the diatoms and none of them show Infusoria so that they are improperly labelled.

I have been unable to procure a sample showing Infusoria and therefore conclude that Kieselguhr is Diatomaceous Earth and is not Infusorial Earth.

Technical uses for this Diatomaceous Earth are chiefly for metal and wood polishes, for manufacture of dynamite in fire-proof compositions, for insulating steam pipes and electrical insulators, also in the manufacture of liquid glass and glass, in packing for caustic or inflammable liquids, and in soap and paper-making.

In pharmacy Kieselguhr is used as a filtering medium, as diluent for powdered extracts, pills, pastes, and to obtain sterile filtrates.

The very light, white Kieselguhr is the proper grade to use in pharmacy. In Germany this grade is known as Terra Silica Calcinata Precipitata which is, of course, too much of a name for ordinary use for such a simple substance.

Kieselguhr may be easily detected under the microscope (200 to 300 diameters), as the forms of skeletons of the diatoms are recognizable, the one that predominates in most of the lighter, white varieties is called Navicula, but various other forms are always distinctly seen.

One sample obtained from a jobbing house shows neither Diatoms nor Infusoria and may not be true Kieselguhr. Also two samples show no naviculæ.

The best variety absorbs four times its weight of water.

The price of the finest quality in single pound lots is twenty-five cents.

Cotton may be used as a filter medium when the liquid contains only large particles in suspension; it is convenient, efficient and economical.

When a filter press is used only a pulp of some sort can be used.

Talcum, the purified kind, is difficult to make and expensive to purchase. Few jobbers can supply it, and when they do, it is often little better than the commercial variety. It is soluble to an uncertain extent and for many other reasons is not always satisfactory.

Kieselguhr is about four times as efficient as Talc, and therefore, since purified talc costs the same as Kieselguhr (25 cents) it is only one-fourth as expensive to use.

A concise statement of Kieselguhr follows:

Kieselguhr, Diatomaceous Earth, Terra Silicæ, SiO_2, the silicious covering or skeletons of the Diatoms obtained from marl by incineration and levigation, absorbs four times its weight of water; distinguished under microscope by skeletons of the various Diatoms.

Pharmaceutical uses, as a filtering medium, and to obtain sterile filtrates, excipient for pills, absorptive diluent for powdered extracts and pastes, etc.

THE NEED FOR FURTHER RESTRICTING THE SALE OF POISONS AND HABIT-FORMING DRUGS.[1]

By M. I. Wilbert, Washington, D. C.

To the credit of American pharmacists it must be said that from the very origin of pharmacy in this country the followers of our craft have recognized the possible danger from the promiscuous use of poisonous substances and have persistently and consistently endeavored to secure legislation that would tend to restrict the sale and use of such drugs to legitimate needs.

While much has been accomplished in the way of restrictive legislation it is unfortunately too true that the greater portion of this legislation serves no useful purpose unless it be that the inclusion of laws in law books, by increasing their size and weight, has of itself a wholesome influence on the body politic.

It has frequently been asserted, and with apparent reason, that we are burdened with laws and cursed with the non-enforcement of them to such a degree that people generally have lost the necessary respect for laws and the purpose of laws.

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[1] Presented at the meeting of the Pennsylvania Pharmaceutical Association, June 18–20, 1912.

That there is much truth in this general assertion is borne out by the fact that since the institution of restrictive legislation relating to the sale of poisons the use of poisonous drugs for criminal purposes has steadily increased. This is evidenced by the fact that the use of poison for suicidal purposes, while a negligible factor prior to half a century ago, has had the unfortunate distinction, for a decade or more, of leading all of the other agencies, and even in the past two years it is second only to the use of firearms regarding the sale of which practically no restrictions exist at the present time.

That it is possible to materially reduce the number of suicidal deaths from any one cause by proper restrictive measures is evidenced by the statement recently made by Thos. F. Darlington, who asserts that the enforcement of a New York City Board of Health ordinance in 1906 reduced the number of suicides from the use of phenol from 343 to 36.

The toll of human lives exacted by poisons, heavy as it is, is of secondary importance to the damage that is being done by the promiscuous and all too wide-spread use of habit-forming drugs, such as opium, morphine and cocaine. Here again American pharmacists were the first to recognize the baneful effects of narcotic drugs upon the community and to agitate for laws that would afford the protection required. Some sixty years ago (1853) a committee of the American Pharmaceutical Association pointed out that: "The immense increase in the consumption of opium and its preparations is a subject that deeply concerns the well wishers of society. Their substitution for alcoholic liquids is all to frequent."

During all of the succeeding years pharmacists through their several associations have consistently agitated for laws to restrict the sale of opiates, but as yet they have been successful only in a minor degree. Thus the President of the United States in transmitting a report of the Secretary of State relative to the control of the opium traffic points out that during the past fifty years with an increase in our population of 133 per cent. there has been an increase of more than 350 per cent. in the amount of opium imported and used. Over 400,000 pounds of opium are imported annually and it is estimated that less than 15 per cent. of this quantity should suffice to meet all the legitimate needs for the drug.

This tremendous increase in the consumption of opium and its derivatives is the more startling when we remember that half a century ago the use of bromides as sedatives was practically unknown, hydrated chloral and related compounds had not been introduced, and the host of sedatives derived from the tar barrel, of which tons are now consumed annually, were not even thought of as possibilities.

In addition to the drugs enumerated above we also have the recently introduced and fiendishly effective derivatives of morphine, such as heroin and its salts, and last but by no means least important as a habit-producing drug, we have cocaine, a drug of great medicinal value that is practically indispensable on the one hand but is unequalled on the other hand as an agent for evil, in that it is capable of destroying both body and mind in a manner that is both quick and effective. Tons upon tons of coca are being used in the manufacture of cocaine, and it is estimated that 150,000 ounces of cocaine and its salts are used annually to further debase the naturally weak and the criminally inclined, and only the recording angel can tell how many and how varied are the crimes that have been committed by habitués under its baneful influence.

While it is true that nearly every State in the union has enacted laws to restrict the sale of habit-forming drugs, it must not be overlooked that many if not all of these laws are ineffective because burdened with provisos and exceptions that make them practically inoperative. A critical review of our anti-narcotic legislation also evidences the fact that up to the present time practically all of this legislation has been designed to restrict only the retail druggist and does not apply either directly or indirectly to the material sold by the manufacturer or jobber or to the drugs dispensed directly to the patient by the physician. This short-coming on the part of our State laws is undoubtedly due to the fact that while pharmacists have evidenced a willingness to have their own business restricted, they have been unable to convince legislators that the sale or the giving away of habit-forming drugs by others should also be safe-guarded in some really efficient manner.

Even the laws restricting the sale of habit-forming drugs by retail druggists are frequently ineffective because of the exceptions that are made for preparations containing supposedly innocuous doses of such drugs. These exceptions, usually embodied in the several State laws because of the general desire to avoid possible opposition to legislation on the part of persons interested in the sale of proprietary remedies, have been the direct cause of the inability or perhaps unwillingness on the part of the State officials to enforce the existing laws, and it is largely because of this fact that some retail druggists have been found who fail to comply with the letter as well as the spirit of existing legislation.

Just at the present time the use of habit-forming drugs is attracting the attention of thinking people in all parts of the world, and the extent to which persons in different walks of life have become addicted to the use of drugs is just dawning on the public at large. The subject is being discussed frequently and with vigor in public meetings and in the daily press and the outcome is bound to produce laws that will effectually restrict and ultimately prohibit the illegitimate sale of habit-forming drugs. The momentous question before us at the present time is: Are the pharmacists of this country really in earnest in their desire to restrict the sale and use of poisons and habit-forming drugs and are they to be counted on to favor, and to insist on, the enactment of legislation that can and will be enforced?

THE CONSTITUENTS OF GELSEMIUM.[1]

By Charles Watson Moore.

Under the title of "gelsemium" several of the pharmacopœias recognize the dried rhizome and roots of *Gelsemium sempervirens,* Aiton, commonly known as the "yellow jessamine."

The medicinal value of the plant is due to the presence of certain alkaloids, only one of which, however, has been obtained in a crystalline condition.

Among the earlier investigations of gelsemium there may be noted that of Wormley (*Amer. J. Pharm.,* 1870, 42, 1), who isolated an impure alkaloidal product to which he gave the name of "gelseminine." This base was afterwards investigated by Sonnenschein (*Ber.,* 1876, 9, 1182) and Gerrard (*Pharm. J.,* 1883, 13, [iii], 641), who assigned to it the formulæ $C_{22}H_{38}O_4N_2$ and $C_{24}H_{28}O_4N_2$ respectively. The last-mentioned investigator was the first to obtain gelsemine and its salts in a crystalline state. Thompson (*Jahresber.,* 1887, 2218), who ascribed to gelsemine the formula $C_{54}H_{69}O_{12}N_4$, showed that it was accompanied in the plant by a second alkaloid, which he obtained in an amorphous condition, and which he designated as "gelseminine." Both gelsemine and gelseminine have more recently been examined by Cushny (*Ber.,* 1893, 26, 1725), who proposed the formulæ $C_{49}H_{63}O_{14}N_5$ and $C_{42}H_{47}O_{14}N_3$ respectively for the two bases. Spiegel (*Ber.,* 1893, 26, 1045) suggested the formula $C_{22}H_{26}O_3N_2$ for the crystalline base, which was confirmed by Gœldner (*Ber. deut. pharm. Ges.,* 1895, 5, 330), who obtained it in colorless crystals, melting at 160°.

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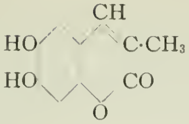
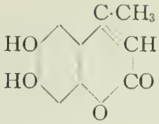
[1] From Transactions of the Chemical Society, vol. 97, 1910.

Some confusion has arisen as to the nomenclature of the two bases isolated from gelsemium; thus in the English literature the crystalline base is referred to as gelsemine, and the amorphous product as gelseminine, whilst most of the German investigators, for example, Spiegel (*loc. cit.*) and Gœldner (*loc. cit.*), use these names in the opposite sense. In this communication the English nomenclature is adhered to.

The present investigation has resulted in the isolation of the alkaloid gelsemine in a pure crystalline condition. The base is found to melt considerably higher than has hitherto been recorded (m. p. 178°, instead of 160°), and it has been conclusively shown to possess the formula $C_{20}H_{22}O_2N_2$. Besides gelsemine and gelseminine, the presence of a third alkaloidal substance in gelsemium has been established. This substance is weakly basic and amorphous, but possesses strongly toxic properties.

It was shown by Wormley (*loc. cit.*) that gelsemine was accompanied in the plant by an acidic substance, which he called "gelseminic acid," an observation which has been confirmed by the present author. Gelseminic or "gelsemic" acid has been shown by Schmidt (*Arch. Pharm.,* 1898, 236, 236) to be a monomethyl ether of æsculetin (4:5-dihydroxycoumarin). Two æsculetin monomethyl ethers are known, which have been incorrectly termed α- and β-methylæsculetin respectively (compare *Beilstein's Handbuch,* III., 568), the compound from gelsemium having been given by Schmidt the latter designation. It is evident, however, that the names α- and β-methylæsculetin can only be correctly applied to substances possessing the following formulæ respectively (Pechmann and Kraft, *Ber.,* 1901, 34, 423):





Gelseminic acid is, therefore, æsculetin 4-(or-5)monomethyl ether, and it is considered desirable to retain for this substance the name "scopoletin," as proposed by Eykman (*Rec. trav. chim.*, 1884, 3, 171), who first obtained it from the rhizome of *Scopolia japonica.* The fluorescent substance, known as β-methylæsculetin, which is contained in the bark of *Prunus serotina* and in jalap (*Trans.*, 1909, 95, 243; *J. Amer. Chem. Soc.*, 1910, 32, 93) would accordingly be more appropriately termed scopoletin.

A summary of the results of the complete investigation of gelsemium, is given at the end of this paper.

EXPERIMENTAL.

The material employed in this investigation consisted of the dried rhizome and roots of *Gelsemium sempervirens,* Aiton.

A portion (20 grams) of the crushed drug was extracted successively in a Soxhlet apparatus with various solvents, when the following amounts of extract, dried at 100°, were obtained:

Petroleum (b. p. 35–50°)	extracted	0.39	gram	= 1.95	per cent.
Ether	"	0.16	"	0.80	"
Chloroform	"	0.34	"	1.70	"
Ethyl acetate	"	0.16	"	0.80	"
Alcohol	"	1.63	"	8.15	"
Total		2.68	grams	= 13.40	

For the purpose of a complete examination, 49.44 kilograms of the ground material were completely extracted with hot alcohol. After the removal of the greater portion of the alcohol, a viscid, dark-colored extract was obtained, amounting to 9.20 kilograms.

Distillation of the Extract with Steam.

A quantity (2 kilograms) of the above-mentioned extract, representing about 10.75 kilograms of the drug, was mixed with water, and steam passed through the mixture for some hours. The distillate, which amounted to 5 litres, contained some drops of oil floating on the surface. It was extracted with ether, the ethereal liquid being dried and the solvent removed, when a small quantity of an essential oil was obtained. This was a very pale yellow liquid, and amounted to about 2 grams, being thus equivalent to about 0.019 per cent. of the weight of the drug.

Non-volatile Constituents of the Extract.

After the distillation of the extract with steam, as described above, there remained in the distillation flask a quantity of a brown resin (A) and a dark-colored aqueous liquid (B). The resin was collected, and repeatedly washed with water until nothing further was removed, the washings being added to the above-mentioned aqueous liquid.

This resin was a brown, viscid solid, and amounted to 412 grams. It was dissolved in alcohol and mixed with purified sawdust, the thoroughly dried mixture being then successively extracted in a Soxhlet apparatus with petroleum (b. p. 35–50°), ether, chloroform, ethyl acetate, and alcohol.

Petroleum Extract of the Resin (A).

Isolation of Pentatriacontane, $C_{35}H_{72}$, *and Emodin Monomethyl Ether.*

The petroleum extract, which formed a brown, semi-liquid mass and amounted to 224 grams, was dissolved in 2 litres of warm ether and the solution kept for some days, when a small quantity of an almost colorless substance separated. This was collected and washed with a little ether, after which it was distilled under diminished pressure. The distillate, which rapidly solidified, was crystallized from ethyl acetate, when it was obtained in small, colorless, glistening leaflets, melting at 75°. (Found, $C = 84.9$; $H = 14.5$. Calc., $C = 85.4$; $H = 14.6$ per cent.)

This substance was therefore pentatriacontane.

The ethereal liquid, from which the pentatriacontane had been removed as above described, was extracted with successive portions of an aqueous solution of sodium carbonate, and finally washed with water. The alkaline liquids and washings were united, acidified, and extracted with ether, when 15 grams of a viscid, oily liquid were obtained. On distilling this liquid under diminished pressure, it passed over between 245° and 255°/25 mm., and then became almost solid. It consisted of a mixture of fatty acids, which were examined in connection with a similar product obtained from the non-acidic portion of the petroleum extract after its hydrolysis.

The ethereal liquid, from which the pentatriacontane and free fatty acids had been removed, as above described, was subsequently shaken with a solution of sodium hydroxide. The alkaline extracts, which had assumed a red color, were acidified and extracted with ether, when a very small quantity of an orange-yellow substance was obtained. This when crystallized from ethyl acetate formed orange-red prisms, which melted at about 190°, and when mixed with a little emodin monomethyl ether, fusion occurred at the same temperature. The quantity so obtained was too small for analysis, but the substance appeared to be emodin monomethyl ether (m. p. 195°), since on heating for a short time with concentrated sulphuric acid it gave a substance soluble in aqueous sodium carbonate and agreeing in its properties with emodin.

Isolation of a Phytosterol, $C_{27}H_{46}O$.

The ethereal liquid which had been extracted with alkalis, as above described, was evaporated, when a quantity of an oily product was obtained. This was hydrolyzed by heating with an alcoholic solution of potassium hydroxide, the alcohol removed, water added, and the alkaline liquid extracted with ether. The ethereal solution was washed, dried, and the solvent removed, when a quantity of brown resinous material was obtained. This was extracted with cold absolute alcohol, in which only a small portion dissolved. The alcoholic solution was concentrated, and a little water added, when, on keeping, a substance separated in flat needles, which after recrystallization from a mixture of dilute alcohol and ethyl acetate formed glistening, flat needles, melting at 136°. The amount of this substance was 1.5 grams:

0.1600, on heating at 110°, lost 0.0072 H_2O. $H_2O = 4.5$.
0.1336* gave 0.4110 CO_2 and 0.1455 H_2O. $C = 83.9$; $H = 12.1$.
$C_{27}H_{46}O,H_2O$ requires $H_2O = 4.5$ per cent.
$C_{27}H_{46}O$ requires $C = 83.9$; $H = 11.9$ per cent.

This substance thus agrees in composition with a phytosterol, and it yielded the color reaction of that class of compounds. A determination of its rotatory power gave the following result:

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* Anhydrous substance.

0.2393, made up to 20 c.c. with chloroform, gave $\alpha_D - 0°58'$ in a 2-dcm. tube, whence $[\alpha]_D - 40.4°$.

The *acetyl* derivative, when crystallized from acetic anhydride, separated in needles melting at 125–127°.

The brown resinous material, from which the phytosterol had been removed by extraction with alcohol, as above described, was thoroughly examined, but nothing definite could be isolated from it. It appeared to consist of a mixture of hydrocarbons.

Identification of the Fatty Acids.

The alkaline aqueous solution of potassium salts, from which the phytosterol had been removed by extraction with ether, as above described, was acidified and again extracted with ether, the ethereal solution being washed, dried, and the solvent removed. A quantity (10 grams) of fatty acids was thus obtained, which, when distilled under diminished pressure, passed over between 240° and 260°/25 mm. As these acids distilled within the same range of temperature as those previously obtained, which existed in the drug in the free state, for the purpose of their examination the two portions were mixed.

Twenty grams of the mixed acids were converted into their lead salts, and the latter digested with ether, when a portion dissolved. Both the soluble and insoluble portions were decomposed by hydrochloric acid, and the regenerated fatty acids purified by distillation under diminished pressure. The soluble portion of the lead salts yielded 11 grams of liquid acids, while the insoluble portion gave 8 grams of solid acids.

The Liquid Acids.—These acids, when distilled under diminished pressure, passed over at about 225°/15 mm. An analysis and a determination of the iodine value gave the following results:

0.1430 gave 0.4030 CO_2 and 0.1518 H_2O. $C = 76.8$; $H = 11.8$.
0.4224 absorbed 0.6783 iodine. Iodine value = 160.
$C_{18}H_{34}O_2$ requires $C = 76.6$; $H = 12.1$ per cent. Iodine value = 90.1.
$C_{18}H_{32}O_2$ requires $C = 77.1$; $H = 11.4$ per cent. Iodine value = 181.4.

In order to obtain more definite information respecting the nature of the above mixture, a quantity of it was oxidized according to the method described by Lewkowitsch (*Chemical Technology and Analysis of Oils, Fats, and Waxes,* 1904, Vol. I., p. 360). This resulted in the formation of tetrahydroxystearic acid (m. p. 157–160°) and a small quantity of dihydroxystearic acid (m. p. 125–127°). It may thus be concluded that the liquid acids consisted chiefly of a mixture of oleic and linolic acids, the latter in predominating amount.

The Solid Acids.—These acids melted at about 55°, and on analysis gave the following result:

0.1383 gave 0.3842 CO_2 and 0.1590 H_2O. $C = 75.8$; $H = 12.7$.
$C_{16}H_{32}O_2$ requires $C = 75.0$; $H = 12.5$ per cent.
$C_{18}H_{36}O_2$ requires $C = 76.1$; $H = 12.7$ per cent.

From this result it would appear that the solid acids consisted of a mixture of palmitic and stearic acids, the latter predominating.

Ethereal Extract of the Resin.

Isolation of Ipuranol, $C_{23}H_{38}O_2(OH)_2$.

This extract was a brown, amorphous mass, and amounted to 10 grams. It was redissolved in about 500 c.c. of warm ether and kept for some days, when a small quantity of an almost colorless, amorphous substance separated. This was collected and crystallized from a mixture of pyridine and dilute alcohol, when it formed microscopic needles, melting at 290°. (Found, $C = 72.3$; $H = 10.5$; Calc., $C = 72.6$; $H = 10.5$ per cent.)

This substance was thus identified as ipuranol, and when treated with sulphuric acid and acetic anhydride it yielded the color reaction shown by this compound. From it was also prepared diacetylipuranol, which separated from acetic anhydride in glistening leaflets, melting at 162°.

The ethereal solution from which the ipuranol had been separated, as above described, was examined, but nothing definite was isolated from it.

The chloroform, ethyl acetate, and alcohol extracts of the resin amounted to 35, 36, and 95 grams respectively, and consisted entirely of amorphous products.

Examination of the Aqueous Liquid (B).

Isolation of Scopoletin.

This liquid, as already indicated, represented that portion of the original alcoholic extract of the drug which was soluble in cold water, and from which the previously-described resin (A) had been removed.

It was thoroughly extracted with chloroform, these extracts being washed, dried, and the solvent removed. A quantity (about 5 grams) of a crystalline compound was thus obtained, which, after recrystallization from alcohol, formed long, almost colorless needles, melting at 204°. Its alkaline solution showed a fine blue fluorescence.

0.1430 gave 0.3286 CO_2 and 0.0550 H_2O. $C = 62.6$; $H = 4.2$
$C_{10}H_8O_4$ requires $C = 62.5$; $H = 4.2$ per cent.

A methoxyl determination by means of Perkin's modification of the Zeisel method gave the following result:

0.2132 gave 0.2584 AgI. $OMe = 16.0$.
$C_9H_5O_3.OMe$ requires $OMe = 16.1$ per cent.

The substance is thus identified as scopoletin, a methyl ether of æsculetin.

Its acetyl derivative separates from acetic anhydride in colorless leaflets, melting at 177°.

Dibromoscopoletin, $C_{10}H_6O_4Br_2$.—Five grams (six atoms) of bromine were added to a solution of scopoletin (2 grams) in about 50 c.c. of chloroform. Hydrogen bromide was slowly evolved, but the liquid did not become colorless. After keeping some hours, a crystalline substance separated, which was removed and recrystallized from alcohol, when it formed yellow, glistening plates, melting at 249°:

0.1682 gave 0.1800 AgBr. $Br = 45.5$.
$C_{10}H_6O_4Br_2$ requires $Br = 45.7$ per cent.

This substance is therefore a *dibromoscopoletin*.

Dibromoscopoletin is sparingly soluble in ether, chloroform, or alcohol, and its solution in alkalis shows a very intense green fluorescence.

The two bromine atoms in dibromoscopoletin appear to be in the benzene nucleus, as this substance instantly decolorizes a cold alkaline solution of potassium permanganate, and, therefore, still contains a double linking. In this respect it resembles the dibromocoumarin described by Perkin (Trans., 1870, 23, 371).

On heating dibromoscopoletin with acetic anhydride, it is readily acetylated. The *acetyl* derivative forms colorless prisms, melting at 224°.

Isolation of Gelsemine, $C_{20}H_{22}O_2N_2$.

The aqueous liquid from which the scopoletin had been removed, as above described, was extracted with successive portions of amyl alcohol. This, however, only removed small quantities of an amorphous nitrogenous product, which was non-basic, and from which nothing definite could be isolated. The liquid was accordingly rendered alkaline with sodium carbonate and thoroughly extracted with ether, the combined ethereal extracts being washed, dried, and the solvent removed. A quantity of a pale yellow product was thus obtained, which crystallized very readily from acetone in handsome, glistening prisms, melting at 175–178°. After recrystallization from the same solvent, its melting point was constant at 178°. The quantity isolated amounted to 12 grams. It gave all the usual reactions characteristic of alkaloids:

1.1448, when heated at 120°, lost 0.1774 acetone. $C_3H_6O = 15.5$.
0.1594* gave 0.4353 CO_2 and 0.0980 H_2O. $C = 74.5$; $H = 6.8$.
0.3458* gave 27.5 c.c. N_2 at 27° and 754 mm. $N = 8.7$.
$C_{20}H_{22}O_2N_2$ requires $C = 74.5$; $H = 6.8$; $N = 8.7$ per cent.
$C_{20}H_{22}O_2N_2, C_3H_6O$ requires $C_3H_6O = 15.3$ per cent.

This substance, therefore, corresponds with the crystalline alkaloid, gelsemine, which has previously been isolated from gelsemium, and for which, as already mentioned, several empirical formulæ have been suggested. The fact that gelsemine crystallizes from acetone with one molecule of this solvent (see above) was confirmed by mixing 1 gram of the air-dried preparation with 20 c.c. of water and distilling the liquid. On adding *p*-bromophenylhydrazine to the distillate, a crystalline precipitate was formed, melting at 93°, which corresponded in all respects with acetone-*p*-bromophenylhydrazone.

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* Constant at 120°.

The molecular weight of gelsemine was determined by the cryoscopic method in acetic acid solution:

0.5250*, in 24.90 acetic acid, gave $\Delta t = -0.270°$. M.W. = 305.
$C_{20}H_{22}O_2N_2$ requires M.W. = 322.

In benzene solution association occurs, and numbers corresponding with twice this molecular weight are obtained:

0.6340*, in 20.70 benzene, gave $\Delta t = -0.248°$. M.W. = 605.
$(C_{20}H_{22}O_2N_2)_2$ requires M.W. = 644.

In order to ascertain whether gelsemine is homogeneous, a quantity was converted into its hydrochloride, and this salt recrystallized, first from dilute alcohol and then from water. The base was then regenerated, and, after crystallization from acetone, again analyzed:

0.1414* gave 0.3866 CO_2 and 0.0880 H_2O. C = 74.5; H = 6.9.
$C_{20}H_{22}O_2N_2$ requires C = 74.5; H = 6.8 per cent.

For further confirmation of the purity of the material, the base was converted into its nitrate. This salt, which forms glistening prisms, melting above 280°, was recrystallized from water, and the base regenerated from it. The product so obtained, after crystallization from acetone, gave the following results on analysis:

0.1462* gave 0.3980 CO_2 and 0.0906 H_2O. C = 74.2; H = 6.8.
$C_{20}H_{22}O_2N_2$ requires C = 74.5; H = 6.8 per cent.

The formula of the base deduced from these analyses is in harmony with the result obtained from the analysis of the hydrochloride.

Gelsemine forms a monohydrochloride crystallizing in small prisms, melting indefinitely at about 300°:

0.5614 gave 0.2310 AgCl. Cl = 10.1.
$C_{20}H_{22}O_2N_2$,HCl requires Cl = 9.9 per cent.

A determination of its specific rotatory power gave the following result:

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* Constant at 120°.

0.3100, made up to 20 c.c. with water, gave $[\alpha]_D + 0°5'$ in a 2-dcm. tube, whence $[\alpha]_D + 2.6°$.

The close agreement of these results shows conclusively that the empirical formula of gelsemine is $C_{20}H_{22}O_2N_2$.

A determination of its specific rotatory power gave the following result:

0.4066*, made up to 20 c.c. with chloroform, gave $[\alpha]_D + 0°39'$ in a 2-dcm. tube, whence $[\alpha]_D + 15.9°$.

Examination of the Amorphous Alkaloidal Products.

The alkaline, aqueous liquid from which the gelsemine had been removed by extraction with ether, as above described, was repeatedly extracted by means of amyl alcohol, when a relatively small quantity of an amorphous, basic product was obtained. This appeared to consist of a mixture, and two alkaloidal products were found to be present, one of which was much more strongly basic than the other. It was dissolved in chloroform, and extracted several times with 1 per cent. aqueous hydrochloric acid, which removed the more strongly basic product. The material obtained on rendering the acid extracts alkaline was isolated by means of chloroform, when it formed an amorphous, brown-colored product. Neither the free base nor any of its salts could be obtained in a crystalline condition. This more strongly basic product appears to correspond with the amorphous alkaloid to which the name " gelseminine " has been given.

The chloroform solution from which the " gelseminine " had been removed by means of 1 per cent. acid, as above described, was shaken many times with 10 per cent. aqueous sulphuric acid, which slowly removed a small quantity of a very weakly basic substance. As in the case of " gelseminine," neither the free base nor its salts could be obtained in a crystalline condition. This substance responds to the usual alkaloidal reagents, but appears to be stable only in the form of its salts, as on keeping a chloroform solution of the base for some time the product becomes insoluble in acids.

The alkaline aqueous liquid from which the alkaloidal products had been removed, as above described, was neutralized by means of acetic acid and treated with a solution of basic lead acetate. This produced a voluminous yellow precipitate, which was collected, washed, and then suspended in water and decomposed by hydrogen sulphide. On filtering the mixture, a liquid was obtained which gave a bluish-black coloration with ferric chloride, and evidently contained a quantity of tannin, but no definite products could be isolated from it.

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* Constant at 120°.

The filtrate from the basic lead acetate precipitate was treated with hydrogen sulphide for the removal of the excess of lead, and the filtered liquid concentrated under diminished pressure to a volume of about 2 litres. The concentrated liquid contained a considerable quantity of a sugar, as it readily reduced Fehling's solution, and yielded *d*-phenylglucosazone, melting at 208–210°.

One-fifth of the total liquid was diluted with water to 1 litre, about 50 grams of concentrated sulphuric acid, diluted with an equal weight of water, added, and the liquid repeatedly extracted with chloroform with the object of isolating any organic acids present. As this operation removed only a small quantity of acetic acid, the acid aqueous liquid was boiled for an hour and again extracted with chloroform, when nearly a gram of scopoletin was obtained. It thus appears probable that a glucoside of scopoletin was present in the original aqueous liquid, but all attempts to isolate this substance were unsuccessful.

Physiological Tests.

The following physiological tests were conducted in the Wellcome Physiological Research Laboratories by Dr. H. H. Dale, to whom the author now wishes to express his thanks:

A quantity (0.1 gram) of gelsemine hydrochloride, when injected intravenously into a rabbit, caused practically no effect, a result which is in agreement with an observation by Cushny.

One milligram of the hydrochlorides of both the amorphous bases, when injected intravenously into rabbits, caused death from respiratory failure in about twenty-five minutes, preceded by convulsions.

Summary.

The results of this investigation may be summarized as follows:

The material employed consisted of the dried rhizome and roots of *Gelsemium sempervirens,* Aiton.

An alcoholic extract of the drug, when distilled with steam, yielded a small amount of an essential oil. The non-volatile constituents, as obtained after treating the alcoholic extract with steam, consisted of a brown resin insoluble in water, and material which remained dissolved in the cold aqueous liquid. The resin, amounting to about 3.8 per cent. of the weight of the drug, yielded pentatriacontane; traces of emodin monomethyl ether; a phytosterol, $C_{27}H_{46}O$ (m. p. 136°; [α] -40.4°); a small amount of ipuranol, $C_{23}H_{38}O_2$-$(OH)_2$; and a mixture of fatty acids, consisting of palmitic, stearic, oleic, and linolic acids. The portion of the alcoholic extract of the drug which was soluble in water, and from which the above-described resin had been removed, contained scopoletin (a monomethyl ether of æsculetin), which was present in the free state, and also in the form of a glucoside, together with a quantity of sugar. It yielded, furthermore, three alkaloidal products, one of which, gelsemine, has been obtained in a pure crystalline state, melting considerably higher than has hitherto been recorded (178°, instead of 160°), and which has been conclusively shown to possess the formula $C_{20}H_{22}O_3N_2$. The other alkaloidal products, one of which corresponds with the so-called "gelseminine" of Thompson (*loc. cit.*) and Cushny (*loc. cit.*), were amorphous, and no crystalline derivative could be obtained from them.

THE WELLCOME CHEMICAL RESEARCH LABORATORIES, LONDON.

RECENT STUDIES ON TURPENTINE OIL.[1]

The method of turpentine-production by the new "cup and gutter" system, which we have repeatedly described in detail, has, according to an American journal,[2] the disadvantage that the cups employed for collecting the balsam are often upset by hogs and other animals which scour the forest for food. Many of the earthenware cups, no matter how carefully they are handled, are lost by breakage, and, finally, a good deal of the turpentine oil is wasted by evaporation. All drawbacks, as well as the danger of fire, are said to be obviated by a new method in which the collecting-vessel and the tapping-place in the tree are connected in an air-tight manner. This is done by boring into the sapwood of the tree a hole of 2⅜ inches diameter, and not too deep. From the centre of this hole two other holes, ¾ inch in diameter each, are bored steep upwards in a slanting direction, to the depth of a few inches. The rough bark surrounding the central opening is smoothed down to admit of the opening being closed with a flat cover. This cover communicates by means of a hollow prop with a second cover placed at right angles to the first, and into this second cover a glass receptacle, holding about one pint, is screwed air-tight. The turpentine collects first in the ¾-inch holes, and flows thence through the wider hole and the hollow prop into the glass receptacle which, when full, is replaced by another. It is said that this new method possesses several advantages over those now in use. Among these, in addition to the avoidance of the disadvantages enumerated above, are the preservation of the trees, coupled with the possibility of tapping them for an unlimited period; the prevention of loss by running or evaporation and the avoidance of the costly and destructive process of preparing the drawing-surface by cutting.

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[1] From Semi-annual Report of Schimmel & Co., April, 1912, pp. 122-130.

[2] *Scientific American* 105 (1911), 383.

It appears to us, at any rate at first sight, that the considerably higher cost-price of the glass receptacles and metal-parts as compared with the simple earthenware cups and tin-strips of the "cup and gutter" method, will be a disadvantage of the new process.

Numerous investigations, especially by French chemists, have shown the pinene of the Aleppo fir (*Pinus halepensis*) to be specially rich in pure *d-α-pinene*. On the other hand, Fernandez[3] has found that the pinene from the Andalusian fir, which is identical with the Aleppo fir, is not quite identical with ordinary pinene. Unfortunately the abstract of Fernandez's paper before us gives no particulars of the constants of the pinene mentioned by him. He assumes the two pinenes to differ from each other because no nitrosites were obtainable from the Spanish pinene. When attacked by nitrogen tetroxide in the presence of acetic acid at 0°, a brownish-black body (probably an oxime) with a cymene-like odor was separated out. This body constituted about 55 per cent. by weight of the pinene used. The corresponding pinene nitrolpiperidine constituted a spongy, non-crystalline mass. With toluidine, Fernandez obtained high-boiling fluids which distilled over between 130 and 141° at 14 mm.; from the naphthylamines and the sulphanilic acid he was unable to obtain nitrolamines. The Spanish pinene only afforded 10 per cent. crystalline terpene.

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[3] *Chem. Ztg.* 35 (1911), 1152. From a lecture.

In the abstract at our disposal several points are left obscure. It is to be regretted that Fernandez does not state the constants of Spanish fir oil. We are uncertain what Fernandez means by his crystallized terpene,—whether camphene, prepared from conversion from the pinene hydrochloride or direct from the oil, or whether terpine? The fact that with aromatic bases such as aniline (and certainly also with homologous bases) pinene nitrosochloride does not afford nitrolamines, but pinene and amidoazobenzene is, we should think, generally known.

To our several notes [4] on Greek turpentine oil from *Pinus halapensis* we are now able to add the result of an examination by Parry [5] who has found two authentic samples to possess the following characters:

	I.	II
d_{15°	0,8605	0,862
α_D	+ 36° 45′	+ 39°
n_{D20°	1,4690	1,4736
Commences to distil at	156°	156°
Fraction 156 to 160°	70%	72%
α_D of 156 to 160° fraction	+ 37° 15′	+ 40°

In addition to the hydrocarbons *l*-pinene and sylvestrene, the presence of which in turpentine oil from *Pinus longifolia* we detected some time ago, [6] H. H. Robinson [7] has found the oil to contain dipentene. Robinson is of opinion that possibly sylvestrene may not be present as such in the original oil, but that the oil may contain a hydrocarbon which, when treated with hydrochloric acid, yields a sylvestrene derivative, in the same way as a hydrochloride results from the treatment of pinene which by splitting off the latter yields camphene.

When the turpentine from the Douglas fir (*Pseudotsuga Douglasii,* Carr) is distilled with steam under low pressure until all the turpentine oil has distilled over, there is left behind a clear, viscous yellow oil (Fir oil) which resembles the so-called pine oil from common turpentine. According to Walker, and also Teeple,[8] this fir oil contains large proportions of terpineol. Benson and Darrin [9] have examined a sample of fir oil, and found it to possess the following constants: m. p. below—40°, $[\alpha]_{D20°}$—37.6°, $n_{D20°}$ 1,4818; solubility in 70 per cent. alcohol 49: 100, acid v. 1,55, sap. v. 11,1, iodine value 185. From its constitution and its behavior under fractionation, as well as from the readiness with which terpine hydrate was formed when the sample was treated with 5 per cent. sulphuric acid, the authors conclude that at least one-third of the oil consists of terpineol, and that for many purposes it may be found to supply a substitute for pine oil.

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[4] Report April 1905, 79; October 1905, 67; October 1909, 69.

[5] Perfum. and Essent. Oil Record 2 (1911), 210.

[6] Report April 1911, 116; October 1911, 93.

[7] Proceed. Chem. Soc. 27 (1911), 247.

Queysanne [10] has proposed a purity-test for turpentine oil based upon its miscibility with aniline, and this same principle was subsequently adopted by Louise [11] in testing turpentine oil. The experiments of Queysanne with lævorotatory French oil have been amplified by investigations conducted by Gallon.[12] The samples of oil under examination possessed the following constants: $d_{15°}$ 0,8675 and 0,8682, $n_{D25°}$ 1,4668 and 1,4655, $\alpha_{D10°}$ + 40,32° and 39,99° respectively. The constants quoted in the second set of figures refer to another, but rather "older," sample of the same oil, the difference in age being shown in the somewhat slighter solubility of the "older" sample. But on the whole, the dextrorotatory oil was not so soluble in aniline as the lævorotatory sample which had previously been examined.

That the chemical testing of turpentine oil offers great difficulties is evident from the numerous publications on the subject. P. van der Wielen,[13] who has been engaged in the investigation of this oil, proposes a modification of the sulphuric acid method. To 80 c.c. sulphuric acid (d. 1,698) in a flask of about 1 litre capacity, he adds 20 c.c. of the oil under examination, and allows the mixture to stand for an hour under repeated shaking. After adding 300 c.c. water the oil which has not been attacked is distilled over into a bottle with a graduated neck. The coefficient of refraction as well as the separation temperature of the solution in aniline are determined. It is also necessary to know the refraction of the original oil. According to van der Wielen, an addition of hydrocarbons[14] may be detected positively from the above data as well as from the quantity of oil which has not been polymerized by sulphuric acid. The author has examined by this method a large number of samples of turpentine oil as well as various substitutes and mixtures with benzene, hydrocarbons and carbon tetrachloride, and has collected the results in table-form.

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[8] Comp. Report November 1908, 125.

[9] *Jour. Ind. Eng. Chem.* 3 (1911), 818. Quoted from *Jour. Soc. Chem. Industry* 30 (1911), 1407.

[10] Comp. Report April 1910, 115.

[11] Comp. Report October 1910, 139.

[12] P. E. Gallon, *Sur la solubilité réciproque de l'essence de térébenthine dextrogyre et de l'aniline.* Bordeaux 1911. From a reprint kindly sent to us.

[13] *Pharm. Weekblad* 8 (1911), No. 35.

For determining the evaporation-residue of turpentine oil, Herzfeld, and also Kollo,[15] recommend the embedding of the platinum dish in a sand-bath, and the heating of the latter to 155° before filling-in the oil. In order to obviate the risk of explosion of the suddenly-generated vapor, a tin-ring is to be affixed below the rim of the dish. Wolff[16] has observed that when the dish is merely embedded in sand, the last particles of oil frequently creep over, and he obviates this trouble by surrounding the dish with a tin-cylinder about 2 inches in height and of a diameter exceeding that of the upper portion of the dish by nearly half an inch. This cylinder is stuck in the sand to a depth of about $\frac{1}{4}$ inch.

In view of the increasing importance of the so-called wood turpentine, as a result of the scarcity of genuine turpentine oil, the U. S. Department of Agriculture has caused two of its chemists, Messrs. Veitch and Donk, to report, in the detailed manner customary with this Department, upon the present experience relating to the production, refining and uses of wood turpentine.[17] The report deals in the first place with the production of the oil by the various processes in use: destructive distillation, steam-distillation, and extraction with volatile and non-volatile solvents. Of these, steam-distillation produces the most useful oil. The distillate obtained by the destructive process. that is to say the fraction which distils over up to 170° and which is also called " wood turpentine " is quantitatively too small in comparison with the oils of higher b. p. Moreover, it is much more difficult to remove the characteristic pine-tar odor of this product by refining, than is the case with the oil obtained by steam-distillation. The method of extracting with volatile solvents is still in its infancy, but several plants use the method of extracting with hot rosin at 200°, which extracts the oil from the chipped wood. The rosin yields the oil to a current of superheated steam which is passed through it, and is afterwards used again for extracting fresh batches of wood. There is also a method of extracting the oil and resin from the wood by boiling the latter with soda liquor and removing the oil from the liquor with a steam-current before the rosin acids are precipitated; the cellulose of the raw material being worked up for paper. Of course the residual wood from the steam-distillation or the extraction with volatile solvents can also be made into paper-pulp or used for dry distillation.

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[14] By hydrocarbons the author apparently understands petroleum-hydrocarbons.

[15] Comp. Report April 1910, 116.

[16] *Farbenzeitung* 16 (1911), 2746. Quoted from *Chem. Zentralbl.* 1911, ii. 1181.

[17] Wood turpentine, its production, refining, properties, and uses. U. S. Dept. of Agriculture, Bur. of Chemistry, Bulletin No. 144, 1911.

Great importance is to be attached to the next process of purifying and fractionating the crude distillate, for which purpose a column-still either working intermittently or continuously, should be used. The distillate resulting from the destructive process is first freed from phenols by means of alkali and then refined by steam-distillation. Generally speaking, insufficient care is bestowed upon this work, and apparently the distillate is not fractionated; hence "carbonization wood turpentine" is not to be regarded as a first-class product, owing to the considerable proportion of high-boiling oils contained in it. The portions of this oil which distil over between 80 and 154° closely resemble rosin spirits; the fraction boiling between 154 and 180° constitutes the destructively-distilled wood turpentine. It contains pinene, dipentene and other compounds which also occur in part in rosin spirits. The higher-boiling oils, with b. p. exceeding 180°, are mixtures of pine-tar and rosin oils in indefinite proportions and are used as greases and solvents, in the manufacture of printers' inks, etc. The constitution of the crude product of the steam-distillation of light wood is very different from the above. As a rule it is collected in the following two or three fractions: wood turpentine proper, b. p. 150–160° up to 175–180°; light pine-tar oil, b. p. 170–180° up to 210–225°; heavy pine-tar oil, b. p. 180–190° up to 230–240°. The first fractions contain chiefly pinene, also camphene, limonene, dipentene, and cineole, and (in case of careless fractionation) more or less terpinene, borneol, and terpineol. The pine-tar oil portions contain, in addition to small proportions of the terpenes, chiefly terpineol, borneol and fenchyl alcohol. A great many attempts have been made to free wood turpentine from its characteristic objectionable odor. It is true that the very first fractions of the steam-distilled oil have a pure odor, but the yield is too small to justify the rejection of subsequent fractions to make it practicable to collect them by themselves, and perhaps to disregard the succeeding fractions. Special experiments carried out by the Department have shown that the unpleasant odor attaches principally, although not entirely, to the higher boiling portions which are still included in the low-boiling fraction, and special importance is to be attached to the removal of these by carefully-conducted fractionation. When this is done, however, wood turpentine very closely resembles genuine turpentine oil, both in its odor and in its constitution. The following table shows the properties of the usual commercial turpentine oils:

Constants	Gum Turpentine oil	Wood turpentine oil	
		Steam-distilled	By destructive process
d_{20°	0,8617 to 0,8889	0,859 to 0,915	0,857 to 0,898
a_{D20°	$-34,8^\circ$ “ $\times 29,6^\circ$	$+16,5^\circ$ “ $+36,14^\circ$	$+34,4^\circ$ “ $+77,6^\circ$
n_{D20°	1,4684 “ 1,4818	1,4673 “ 1,4755	1,4666 “ 1,4810
Initial distilling point (uncorr.)	154 “ 159°	153 “ 177°	150 “ 169°
Distilling below 170°	73 “ 99%	0 “ 95%	0 “ 93%
Distilling below 185°	88 “ 99%	20 “ 98%	61 “ 97%
Iodine value according to Wijs	350 “ 400	300 “ 362	300 “ 398
Acid v	0,140 “ 0,286	0,080 “ 0,312	0,028 “ 0,246
Sap. v	2,44 “ 8,60	1,06 “ 8,75	0,65 “ 4,32
Color (Lovibond)			
for yellow	0,7 “ 2,5	0,5 “ 10,0	0,4 “ 4,5
for red	0,0 “ 0,5	0,2 “ 1,4	0,0 “ 0,8

The iodine-value is regarded as of significance, inasmuch as it indicates the proportion of heavy oil; but similar conclusions may be drawn from the saponification-value. Comparison of the crude with the rectified oils and their constants shows that rectification, as it is carried out in practice up to the present, hardly improves the quality, but only produces a distillate of a paler color. The authors of the report go into full details on the subject of the experiments in fractionation which they conducted on a large scale, both in a simple and in a column still with direct steam. So far the record of the working showed no considerable difference in the action of the two stills, but it is said that no definite judgment can yet be formed. So far as the evaluation of an oil-fraction in respect of its value as good, low-boiling wood turpentine is concerned, neither the often varying temperature of the steam which passes over, nor the specific gravity of the oil-particles is conclusive, but rather, according to practical experience, the respective proportions of oil and water in each fraction that distils over. The higher the proportion of oil, the more closely the properties of the oil approximate those of a good wood turpentine. When the total-distillate contains 55 per cent. oil or more, the proportion of good oil boiling below 170° is 90 per cent.; when the total proportion of oil ranges from 55 to 30 per cent., renewed steam-distillation is needed in order again to obtain a light portion containing 55 per cent. of good oil (as before). Finally when the oil-content of the total distillate falls below 30 per cent., it consists entirely of high-boiling oils, which it is unnecessary to try to work up for oils with b. p. below 170°.

With a view of deciding the important question to what extent the various wood turpentines could be used in the manufacture of paints and varnishes side by side with gum spirits, several varnishes were prepared with four samples of commercial oils, consisting of one sample each of guaranteed pure oil from gum of a steam-distilled wood turpentine, and two wood turpentines prepared by the destructive process and subsequently washed with soda and steam-distilled. In connection with these experiments it is expressly stated that, apart from one of the two samples last-mentioned, the wood oils contained large proportions of heavy oil, from which they derived a pronounced odor, and which caused the varnishes prepared with them to dry more slowly than usual. It is evident that varnishes prepared with oils of this description must give less satisfactory results than when a well-rectified oil had been used. From each of the four samples two kinds of varnishes were prepared, a coach finishing varnish and a piano varnish, with a view of testing their qualities under different atmospheric influences. We are unable to quote here the very detailed reproduction of the reports of the numerous firms which instituted these tests; partly preparing the varnishes themselves, and partly using them only. The disagreeable odor and the irritant action of the wood turpentine are generally commented upon; on the usefulness of the varnishes themselves the opinions differ. On the other hand the producers of wood turpentine of course claim that their productions are entirely suitable for the manufacture of paints, varnishes, etc.

We are now able to complete, on the authority of an American report, the particulars given in our last Report (p. 92) concerning the output of the various products of the American wood-distilling plants.[18] From this it appears that in the year 1910 thirty plants were engaged in the distillation of soft woods, principally yellow pine, together with small quantities of Norway pine and Douglas fir. The plants turned out an aggregate of 192,442 cords soft wood, as compared with 115,310, 99,212, and 62,349 cords in the years 1909 to 1907—a proof of the increasing importance of the wood-turpentine industry.

In view of the large imports of Finnish and Swedish pine-tar oil into France, which are probably due principally to the prohibitive customs duty upon pure turpentine oil, a brief essay by Blarez and Vèzes[19] on the properties of pine-tar oil from Northern Europe should be very useful to all those in France who are interested in oil of turpentine. In making comparisons between genuine turpentine oil and pine-tar oil, the following general characteristics of the latter chiefly deserve consideration: its very marked empyreumatic, unpleasant odor; its lower sp. gr. (d_{25° 0,8520 to 0,8570); its lesser degree of volatility, a property which varies considerably in different samples; its higher co-efficient of refraction (n_D 1,4700 to 1,4800) which also varies in the separate fractions, and, finally, its dextrorotation ($\alpha_D + 4$ to $+ 5^\circ$). Other points of difference are the readiness with which pine-tar oils dissolve in aniline, and Herzfeld's reaction. Mixtures of pine-tar oil with turpentine oil from the Landes may be detected and quantitatively estimated most readily by determining the rotation and by the temperature at which a mixture with known quantities of aniline separates.

To detect the presence of pine-tar oil in turpentine oil, Herzfeld has recommended the shaking of the latter with an equal volume of solution of sulphurous acid (yellow coloration denotes the presence of pine-tar oil; comp. Report April, 1905, 78). Herzfeld has also recommended another test, consisting in pouring the oil under examination over a piece of caustic potash, when the presence of pine-tar oil is revealed by the caustic potash rapidly assuming a brown color (Report April, 1910, 110). H. Wolff[20] has modified the last-named test by shaking up 0,5 to 1 c.c. potash liquor (d 1,3) with the oil, warming the mixture on the water-bath for 2 to 5 minutes, and then adding 3 c.c. water to separate the emulsion. Pine-tar oil causes the aqueous layer to assume a brown color, turpentine gives none, or only a very faint color. Wolff gives two more tests for pine-tar oil which we quote below, without expressing an opinion on their value:

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[18] *Oil, Paint and Drug Reporter* 80 (1911), No. 26, p. 9.

[19] *Sur l'essence de pin des pays du Nord de l'Europe.* Bordeaux 1911. From a reprint kindly sent to us.

1. Five c.c. oil are brought to boiling with 5 drops nitrobenzene, when 2 c.c. (25 per cent.) hydrochloric acid are added and the mixture is kept boiling for 10 seconds more. Pine-tar oil turns brown, the hydrochloric acid brown to black. Turpentine oil gives much paler tints.

2. To a mixture of 4 c.c. each of ferric chloride (1 : 2500) and potassium ferricyanide solution (1 : 500) add from 2 to at most 10 drops of the oil to be tested and shake the whole vigorously. Pine-tar oil will rapidly give a copious precipitate of Prussian blue, whereas turpentine oil only gives a perceptible separation of that body after the lapse of some hours.

C. Piest[21] proposes the following reaction to effect the same object:

Shake in a test-tube 5 c.c. acetic anhydride with 5 c.c. turpentine oil, and add 10 drops concentrated hydrochloric acid while shaking and cooling. When the mixture has cooled down completely add, with shaking, 5 drops more of concentrated hydrochloric acid; this will cause the liquid to become warm and to make a clear solution. Turpentine oil then remains water-white, pine-tar oil turns black.

In every case the turpentine oil, whatever its origin, should be distilled before being tested.

In commenting upon a paper by Grimaldi on the detection of camphene in light resin oil and in other oils,[22] we took exception, in a footnote, to the use by Grimaldi of the designation "turpentine-essence" for light resin oil, because, especially in translating, the term encourages confusion with turpentine oil. In a letter which he has addressed to us Grimaldi disowns the authorship of the term, and declares that he has taken it from a paper by Valenta,[23] who may possibly have borrowed it himself. It is also necessary, Grimaldi observes, to differentiate between turpentine essence, and light resin oils or pinoline; the last-named being that product of the distillation of colophony which passes over at up to about 230°, whereas "turpentine essence" constitutes the most volatile fractions of that distillation, boiling over between 160 to 170°.

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[20] *Farben Ztg.* 17 (1911), 21, 78. Quoted from *Chem. Ztg.* Repert. 36 (1912), 64.

[21] *Chem. Ztg.* 36 (1912), 198.

[22] Report April 1911, 118.

We admit that in our footnote we drew no such sharp distinction between the two distillates, as we did in previous Reports.[24] That, anyhow, was not our principal object, which was chiefly to enter a protest against the use of the name "turpentine essence" as inappropriate, without, however, expressing an opinion on the authorship of the term. And on the point to which we attach the most importance, Grimaldi agrees with us.

BOOK REVIEWS.

Industrial Organic Chemistry. Adapted for the use of manufacturers, chemists, and all interested in the utilization of organic materials in the industrial arts. By Prof. Samuel P. Sadtler. Fourth Edition (Revised, Enlarged and Reset). Philadelphia: J. B. Lippincott Company. London: 5 Henrietta Street, Covent Garden, 1912.

It is now a little more than twenty years since the first edition of Professor Sadtler's Industrial Organic Chemistry was published. While it is true there were a number of standard German and French works, as well as excellent dictionaries of applied chemistry, upon the market at that time, yet there was and is a pressing need felt by industrial chemists in the United States and England for a work giving succinctly and yet thoroughly the results of modern investigations which are scattered in a number of excellent technical journals, and embodying present day practices in the various large industries. The first edition was upon the market but a few years when it became exhausted so that a new edition appeared in 1895. This was followed by a third edition in 1900, which has been practically out of print for several years past. A new edition was not published, as the author, who is one of the most eminent consulting chemists in the United States, an author of a number of excellent works on chemistry and a professor of chemistry, could not "take up the careful review of the field of industrial organic work required for a proper revision of this book."

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[23] *Chem. Ztg.* 29 (1905), 807; Report October 1905, 70.

[24] As, for example, Report October 1905, 71; April 1908, 105.

Fortunately he has been able recently to revise the work and we now have this standard work brought up to date with the inclusion of new matter in nearly every chapter and the description of many new technical products. Full and accurate statements regarding the newer industries are also given for the first time, such, for example, as those relating to the artificial silk industry, the by-product coke oven, the manufacture of synthetic indigo, etc.

While, of course, Sadtler's Industrial Organic Chemistry is especially valuable to the manufacturer in the industrial arts and to students of applied organic chemistry it will also be found to be of very great use to pharmaceutical manufacturers. Probably in no one work will one find so much information on subjects which either directly or indirectly concern him as in the volume at hand. The following are some of the industries that are thoroughly described, the products of which are of very great interest to pharmacists: industry of fats and fatty oils, industry of essential oils and resins, cane sugar industry, fermentation industries, milk industries, glue and gelatin manufacture, industries based upon destructive distillation, as of wood and coal, the manufacture of artificial coloring matters, and natural dye colors. The chapters dealing with these various industries are also supplemented with an extensive bibliography and with facts of statistics which will be found invaluable to the pharmaceutical analyst and manufacturer. The amount of information which is here available will save anyone interested in these subjects a vast amount of time. No one except a specialist of long standing, with excellent literary ability and sound judgment could possibly present in 600 pages this vast amount of well-digested material that we find in the present volume. The mechanical part of the book is in consonance with the subject matter. The proof reading has been well done. It is practically free from errors and the author and publishers are to be congratulated upon the appearance of the present volume.

The British Pharmaceutical Codex. An imperial dispensatory for the use of medical practitioners and pharmacists. Published by direction of the council of the Pharmaceutical Society of Great Britain. London: The Pharmaceutical Press, 72 Great Russell Street, W. C., 1911.

The first edition of this excellent work was published in 1907. Naturally it was subject to extensive criticism and discussion, and as the Council invited the pharmacists of the British Empire to coöperate in rendering the Codex more generally useful and valuable as a book of reference, much valuable material for revision was received. The revision of the new work was entrusted to Mr. John Humphrey, well known as the author of excellent pharmaceutical books and papers. With a corps of collaborators and associates Mr. Humphrey has been enabled to prepare a most commendable work, one that reflects his excellent judgment and ability and that is most creditable to the Council of the Pharmaceutical Society of Great Britain. Any pharmacist, whether he reside in Great Britain and her colonies or in the United States and that does not have the Codex for use in the laboratory and behind the prescription counter, can hardly appreciate under what serious disadvantages he is working. The book contains a vast amount of useful information relating not only to official substances but to nearly all the unofficial products which are generally used, and is practically indispensable to the dispensing as well as manufacturing pharmacist.

Allen's Commercial Organic Analysis. Vol. VI. Fourth Edition. Entirely rewritten. Edited by W. A. Davis and Samuel S. Sadtler. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street, 1912.

The editor of this Journal has repeatedly called attention in the reviews of the preceding 5 volumes of Allen's Commercial Organic Analysis to their value to the manufacturing pharmacist. The present volume, treating as it does of the alkaloids, alkaloidal drugs and their assays, will be sure to be of very great interest to pharmacists generally. The subjects covered include the following: amines and ammonium bases; aniline and its allies; naphthylamine, pyridine, quinoline and acridine bases; vegetable alkaloids; volatile bases of vegetable origin; nicotine and tobacco; aconite alkaloids; atropine and its allies; cocaine; opium alkaloids; strychnos alkaloids; cinchona alkaloids; berberine and its associates; caffeine, tea and coffee; cocoa and chocolate.

RUDIMENTS OF LATIN, with special reference to the nomenclature of the U. S. Pharmacopœia, the National Formulary and the text-books in Materia Medica and Botany, including also prescription writing and notes on the nomenclature of the German Pharmacopœia. By Prof. Julius W. Sturmer, Purdue University. Second Edition. Published by the author. 1912. $1.25.

One of the pleasing signs in the development of the science and art of pharmacy is the fact that instruction in the rudiments of Latin is now given in very many of the colleges and schools of pharmacy in the United States. Apart from the question whether Latin should be obligatory or elective preliminary requirement, experience has shown that all students are benefited by the instruction on this subject. Accuracy in the use of Latin titles is as necessary to the pharmacist as accuracy in the employment of chemical symbols or weights and measures. Furthermore the study of the origin and derivation of pharmacopœial names shows that the latter are not given arbitrarily but are the result of thought and learning.

Professor Sturmer's work is too well known to require an elaborate review at this time. It is sufficient to say that it meets existing conditions very well and it were well if pharmacists generally had this work in their libraries. It is a splendid book for the student and is doubtless quite generally employed by teachers in colleges of pharmacy in the United States as a text-book.

HANDBUCH DER PHARMAKOGNOSIE von Prof. A. Tschirch. Lief. 26–30. Leipzig: Chr. Herm. Tauchnitz.

It is always a pleasure to learn that additional numbers of the Lieferungen of Tschirch's Handbook on Pharmacognosy are available. The admiration with which we have on previous occasions referred to this remarkable work continues as the work progresses. Again and again we find in this work an exhaustive treatment of the substances which are becoming more or less extensively used, but which are not generally considered in the text-books or works of reference, as agar-agar, kieselguhr, characteristics of the different kinds of arrow-root starch, fixed oils, mannas, etc.

It is almost unnecessary to state again that Tschirch's Handbook is indispensable to research students and manufacturing pharmacists and should be in the libraries of all colleges and universities where information is sought concerning products of vegetable and animal origin.

THE ART OF DISPENSING. A treatise on the methods and processes involved in compounding medical prescriptions, with dictionaries of abbreviations and terms used in British and foreign prescriptions, incompatibles and new remedies, and numerous memoranda for dispensers and prescribers. By Peter MacEwan, editor of *The Chemist and Druggist.* Ninth Edition. Published at the offices of *The Chemist and Druggist,* 42 Cannon St., London, E. C. 1912. 6s. net.

A new edition of this work has just been published. It is the ninth since the treatise first appeared in book-form in September, 1888. It has been critically revised throughout, a great deal of new matter being added, which may be exemplified by some excerpts of additional annotations in the chapter on pills.

THE PILL SPATULA (p. 78).—"It should be straight across at the point and sharpened so as to scrape well. Most pill spatulas supplied by sundries houses are too thick at the point."

SOFT MASSES (p. 84).—"A pill-tile placed over a small water-bath is convenient and rapid [for reducing the softness of a mass]. Experience indicates that it is well to make an allowance of 3 or 4 per cent. for loss, as it is practically impossible to scrape *all* the dried extract off the drier."

ALTHÆA AS AN EXCIPIENT (p. 87).—Another good excipient powder for such things as carbolic acid is a mixture of equal parts of althæa and licorice. For carbolic acid "some prefer flour with 3 per cent. of powdered tragacanth and, if required, a little syrup to moisten."

RESIN OINTMENT makes good pills of ferri et quininæ citras and similar articles which cake with aqueous excipients.

CARBOLIC-ACID PILLS (p. 98).—"The modern tendency is to use a dilute mass—1 of acid in 4 or 5—and to make it firm so that the pills will not dissolve quickly."

FERRI PROTOCHLORIDUM (p. 116).—"An excellent mass, which allows leisurely manipulation, is made by adding about an eighth of its weight of powdered liquorice-root and sufficient anhydrous wool-fat to mass."

FERRI ET AMMONII CITRAS (p. 116).—"Proof spirit makes an excellent mass, which has to be finished off quickly. Pills of this salt . . . should be dispensed in a well-corked vial."

FERRI SULPHAS (p. 116).—"Liquid glucose is a perfect excipient for the dried salt; 36 grains require about 12 grains."

PIL. COLOC. CO. (p. 123).—"An excellent mass is made by adding 10 grains of powdered tragacanth to 180 grains of the species and massing with 15 minims of water. Pills made in this manner take a fine polish and retain their shape well."

It may be recalled that the plan of "The Art of Dispensing," after the discussion of principles and compounding operations and dispensing practice generally, is to deal with solid forms of medicines, beginning with Pills, after which there are chapters on Tablets, Lozenges, and Pastilles, one on Capsules, another on Powders, the next on Suppositories, Bougies, and Pessaries, then come Ointments, Plasters, and Pastes and Jellies, which link the foregoing with liquid medicines; these begin with Mixtures. Then follow chapters on Emulsions and on Applications. The last-named was originally a modest chapter of six pages, entitled "Lotions, Liniments, and Injections," but now it deals with Lotions, Injections, Ampoules, Embrocations, Liniments, Sprays, and Inhalations, and consists of 27 pages. It is followed by a chapter on Incompatibles, which is as popular with "authors" as it is with dispensers. A chapter on Foreign Prescriptions follows this, and contains many modern examples of French and German prescriptions; while as a supplement to the chapter we may mention that the old Dictionary of Terms used in French and German prescriptions has been extended into a more exhaustive one, embracing also Dutch, Italian, Norwegian, Portuguese, and Spanish terms. "New and Unofficial Remedies" in the first five editions of the book were embraced in 12 pages devoted to 53 specific articles. Now the chapter extends to 58 pages of double-column matter in smaller type, and it contains notes on over 700 specific articles. The chapter is one of the most striking examples of the innovations which have been made in dispensing-practice during the past two decades. It has proved to be most serviceable to the pharmacists of the British Empire, and gives the dispenser practically all that he wants to know as to the compounding of these remedies and their modes of administration, as well as the doses and any other points which may be of service in the dispenser's relations with the prescriber.

"The Art of Dispensing" is one of the most helpful books that has been published for the use of the retail pharmacist. The apothecary that has stopped in his education and refuses to see any better way of doing things is doomed ultimately to see his trade going to those men who are keeping up with the march of progress. Mr. MacEwan has the rare good fortune as editor of the *Chemist and Druggist* to know quite well the prevailing practices in the stores throughout Great Britain and fortunately has a mind capable of selecting and assimilating the good ideas of the many pharmacists, with whom he is continually thrown in contact. He has brought the results of his observations into concise and readable form in "The Art of Dispensing," which is a work that will be found not only useful but stimulating to the man behind the prescription counter. It is growing to be more and more highly appreciated by the pharmacists in the United States.

METHODS OF ORGANIC ANALYSIS. By Prof. Henry C. Sherman. Columbia University. Second edition. Rewritten and enlarged. New York: The Macmillan Company, 1912. $2.40 net.

This book was prepared as a laboratory guide in organic analysis, especially of plant and animal substances and their manufactured products. The greater part of the book is devoted to the consideration of the quantitative methods employed in the study of food materials and related substances. It is well adapted to class-room work and where it has been adopted has been found successful. The scope of the work has been somewhat extended, the new matter including matter of particular interest to pharmaceutical chemists, as the new international methods of glycerin analysis, the quantitative methods for the testing of enzymes, and discussions on detecting food preservatives, etc. On account of the thoroughness with which the analytical processes are described and the extensive citations to the literature the work will prove of the greatest value to students in organic analysis as well as the professional analyst.

DIGEST OF COMMENTS ON THE PHARMACOPŒIA OF THE UNITED STATES OF AMERICA AND ON THE NATIONAL FORMULARY. For 1909 and 1910. By Murray Galt Motter and Martin I. Wilbert. Washington: Government Printing Office, 1912.

The volumes for 1909 and 1910 of the Digest of Comments have recently been issued as Bulletins 79 and 84 respectively of the Hygienic Laboratory of the Public Health and Marine-Hospital Service. In view of the facts that the readers of this JOURNAL are for the most part thoroughly familiar with these Bulletins, it is not necessary to attempt to write reviews of them or to describe the progress in pharmacy during the years 1909 and 1910. From a rather careful perusal of these volumes it is quite apparent that not much, if anything, appears to escape the attention of the authors of these "Digests." The work throughout has been very painstaking and thorough and even typographical errors, if they occur, have not been detected by the reviewer. The point of view of the authors is excellent and their sympathies are rather broad. Furthermore, they are able to see the point of an article and express the results of a writer in the tersest language possible. The "Digest of Comments" might well be employed as standard books of reference in the cirriculum of the colleges and schools of pharmacy throughout the United States.

THE MEETING OF THE AMERICAN MEDICAL ASSOCIATION.

The sixty-third annual session of the American Medical Association, held in Atlantic City, N. J., June 4–7, 1912, was attended by 3600 physicians from all sections of the country and will long be remembered as one of the most successful meetings of the Association. Upwards of 400 papers were read and discussed in the fourteen Sections of the Association and as in former years pharmacy, at least in its broader scope, was given considerable attention.

Among the more interesting happenings must be reckoned the revision of the principles of medical ethics as agreed to by the House of Delegates. These principles as now enunciated are broad in their scope and can readily be subscribed to all by true practitioners of medicine. Section I defines the object of a profession as follows:

"A profession has for its prime object the service it can render to humanity; reward or financial gain should be a subordinate consideration. The practice of medicine is a profession. In choosing this profession an individual assumes an obligation to conduct himself in accord with its ideals."

Section 4 of Chapter 3 relates specifically to the practice of pharmacy and reads as follows:

"By legitimate patronage, physicians should recognize and promote the profession of pharmacy; but any pharmacist, unless he be qualified as a physician, who assumes to prescribe for the sick, should be denied such countenance and support. Moreover, whenever a druggist or pharmacist dispenses deteriorated or adulterated drugs, or substitutes one remedy for another designated in a prescription, he thereby forfeits all claims to the favorable consideration of the public and physicians."

The proceedings of the Section on Pharmacology and Therapeutics were of unusual interest to pharmacists and not a few members of the American Pharmaceutical Association from Philadelphia, New York and other cities attended the sessions of this Section and took part in the discussions. Professor Joseph P. Remington at the opening session of the Section presented an address as Chairman of the delegation from the American Pharmaceutical Association and the members of the American Pharmaceutical Association present were on motion accorded the privileges of the floor.

Among matters of direct interest to pharmacy discussed by this Section, the first on the program is embodied in the symposium on patents and trade-marks. The discussion on this subject was participated in by retail druggists, physicians, manufacturers and others interested in the granting or non-granting of patents on commercial substances used as medicines. As a direct outcome of the discussion a Committee was appointed to request that the Board of Trustees of the American Medical Association sue for the annulment of the trade-mark registration of an article used as medicine. On motion the Section on Pharmacology and Therapeutics resolved that the delegate of the Section to the House of Delegates be instructed to request that the House of Delegates instruct the chairman of the Council on Health and Public Instruction to endeavor to secure a modification of our American Patent Laws eliminating product patents on chemical substances used as medicine.

The desirability of a more restricted materia medica was discussed from the standpoint of the chemist by W. A. Puckner, Chicago, that of the pharmacist by Henry P. Hynson, Baltimore, of medical instruction, by E. Lefevre, New York, the medical practitioner by Oliver T. Osborne, New Haven. Further discussion was participated in by a number of the members present, the general outcome of the discussion being in harmony with the proposed action of the Committee on Useful Remedies of the American Medical Association to present for discussion and general use a list of important medicaments to which examination in materia medica subjects by state medical examining and licensing boards might be restricted, and which list might be used as the basis for instruction in materia medica subjects by teachers in medical schools.

In a joint meeting with the Section on Preventive Medicine and Public Health the use of intestinal antiseptics and the standardization of disinfectants were discussed at length, and it was shown that many of the commercially available disinfectants were inefficient and that satisfactory standardization of this class of articles must be insisted on.

Dr. Robert A. Hatcher, New York, and Dr. Carey Eggleston, New York, presented comprehensive papers on the action of digitalis and digitalis-like bodies, and these communications will no doubt go far toward establishing more definite knowledge of these important drugs.

A symposium on drug standards and drug standardization was participated in by Professor Joseph P. Remington, who presented a report of progress of the U.S.P. revision; L. F. Kebler, who discussed the quality of drugs on the market; R. H. True, who reviewed the experiments made in drug cultivation by the Bureau of Plant Industry of the United States Department of Agriculture; Horatio C. Wood, Jr., who discussed the ideals and limitations of bio-assay; Henry Kraemer, who reviewed the history and the possibilities of the retail pharmacist as a purveyor of pure drugs, and Julius H. Comroe, who discussed prescribing versus dispensing on the part of medical practitioners.

The concluding symposium, of the section program, on anæsthesia, was one of vital importance, not alone to physicians and pharmacists but also to patients generally who must assume the risks attending general or partial narcosis. In the course of this symposium Professor Charles Baskerville, of New York, presented a comprehensive review of the work that he and his students have done on the chemistry of inhalation anæsthetics and incidentally pointed out the differences now existing in the standards for the several anæsthetics included in different pharmacopœias. He asserted that these standards varied widely and that many, including those of the U.S.P., permitted the presence of dangerous contaminations that should not be allowed. Statistics relating to mortality from anæsthetics were discussed by several physicians and the use of spinal anæsthesia or analgesia was commented on at length. Altogether, the papers presented in this symposium will well be worth careful perusal on the part of pharmacists who are interested in supplying the best that the market affords in the way of anæsthetics and of preventing contamination or adulteration of the articles supplied by them.

The meeting of the American Medical Medical Association, in 1913, will be held in Minneapolis, in June.

M. I. Wilbert.

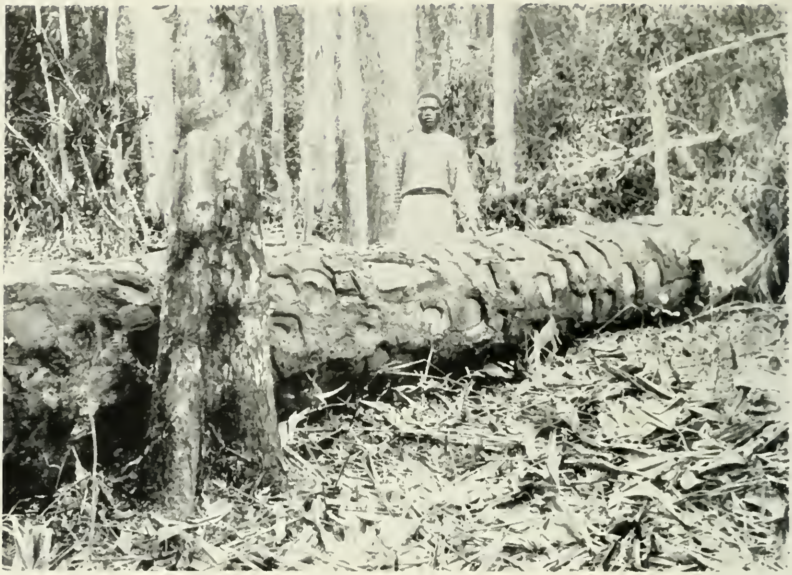

Fig. 1

Erythrophloeum Guineense, G. Don.
A felled tree, in the Belgian Congo, from which the so-called "Sassy Bark" or "Nkasa" had been collected for many years.

In the foreground of this picture are to be seen a few bones, the remnants of a victim of witchcraft who had been burned after receiving a fatal dose of "Sassy Bark" or "Nkasa" (Erythrophloeum Guineense, G. Don)

Reproduced from photographs by Inez C. Wickware, Boma, Belgian Congo

THE AMERICAN
JOURNAL OF PHARMACY

AUGUST, 1912

CHEMICAL EXAMINATION OF THE BARK OF ERYTHROPHLŒUM GUINEENSE.

By Frederick B. Power and Arthur H. Salway.

A Contribution from the Wellcome Chemical Research Laboratories, London.

The genus *Erythrophlœum* appears to comprise but few species, of which the best known is *E. Guineense*, G. Don of Central and Western Africa. Other species are *E. Couminga*, Baill. from Madagascar; *E. Fordii*, Oliv. from Farther India; *E. chlorostachys* (F. von Mueller), Baill. from Australia, and *E. densiflorum* (Elmer), Merrill, formerly known as *Cynometra densiflora*, Elmer, from the Philippines.[1] In addition to these, Planchon [2] notes that Gagnepain (*Notulæ systematicæ* de Lecomte. Herbier du Muséum de Paris, *t.* ii, fasicule 4, p. 111 *et seq.*) has recently named and described two species which are peculiar to Farther India, namely: *E. cambodanium* and *E. succirubrum*.

The bark of *Erythrophlœum Guineense*, G. Don (Nat. Ord. *Leguminosæ*) is known by a number of common names, such as "sassy bark," "mancona bark," "red-water tree bark," "casca bark," "doom bark," and in the vernacular of the Congo as "Nkasa." [3] It was brought to notice many years ago [4] on account of its intensely poisonous properties, by reason of which it has long been employed by the natives of Western Africa as an ordeal in their trials for witchcraft and sorcery, as well as for other criminal purposes. It also apparently enters into the composition of the arrow poison of the Pigmies.[5] A description of the bark, together with observations respecting its physiological action or that of its constituent alkaloid, has been recorded in various works of reference, such as the "Dispensatories" and other commentaries on the Pharmacopœias, as well as in the periodical literature of pharmacy and medicine. Since these sources of information are so readily available, the present consideration of the literature may chiefly be restricted to some previously published statements respecting the alkaloidal constituent of the bark.

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[1] *Philippine Journal of Science*, 1909, **4**, 267.

[2] *Annales du Musée colonial de Marseille*, 1911, **19**, 6.

[3] The designation "Nkasa" does not seem to be a specific one, since it is also applied to *Strychnos Dewevrei*, Gilg, and possibly to other plants. It has, furthermore, been stated that the expression "Nkasa" does not denote, as has been supposed, the plant from which the ordeal poison has been obtained, but the ordeal itself, and that it is used throughout the Congo ("Compagnie du Kasai. Mission permanente d'Études scientifiques." Résultats de ses Recherches botaniques et agronomiques, mis en order et annotés par E. de Wildeman, Brussels, 1910, p. 211 *et seq.*).

[4] This Journal, 1849, **21**, 97: 1851, **23**, 301, and 1852, **24**, 195. Also *Pharm. Journ.*, 1856, **16**, pp. 233, 373.

The so-called "Sassy Bark" appears to have been first chemically examined by Gallois and Hardy,[6] who isolated from it a very toxic alkaloid which they designated erythrophleine. This was stated to have been obtained by one method as a transparent, amorphous solid, of a pale amber color, firm consistence, and gummy to the touch, whereas by another method it was yellowish-white, transparent, and had a crystalline appearance, which could be confirmed by the microscope. It was soluble in water and in alcohol, but very slightly soluble in ether or chloroform. The alkaloid was furthermore described as yielding a crystalline hydrochloride and platinichloride, and as giving with potassium permanganate and sulphuric acid a violet color, less intense than that produced by strychnine, and soon changing to a dirty brown. No analysis, melting point, or other specific characters of any of these substances were, however, recorded. The same authors state to have obtained from *Erythrophlœum Couminga* an alkaloid which was believed to be closely related to erythrophleine, if not identical with it.

A pharmacological investigation of erythrophleine was subsequently conducted by Harnack and Zabrocki.[7] The alkaloid employed by them was prepared by a German manufacturer, and it was recorded that the base, as well as its salts and double salts, could be obtained only in the form of clear syrups. The substance produced both with cold-blooded and warm-blooded animals the combined effects of digitalin and picrotoxin (clonic spasms). After an interval of several years the investigation was renewed by Harnack,[8] with the use of material which had been procured from the same manufacturer as that previously employed. This specimen of erythrophleine hydrochloride was, however, in the form of a fine, pale yellow, amorphous powder, which, on keeping, agglomerated to a dry, solid mass. In distinction from the alkaloid previously examined, it produced only a digitalin-like effect, and not also that of picrotoxin. The base obtained from this salt was almost completely insoluble in water, but readily soluble in alcohol and in ether, and, contrary to the statement of Gallois and Hardy (*loc. cit.*), showed no tendency to crystallize. From analyses of the platinum salt, the base was considered to possess the formula $C_{28}H_{43}O_7N$ or $C_{28}H_{45}O_7N$, but the difficulty was noted of obtaining preparations which were sufficiently uniform in composition to ensure trustworthy results. On heating with concentrated hydrochloric acid it yielded an amorphous, acidic product, designated erythrophleic acid, $C_{27}H_{40}O_8$ or $C_{27}H_{42}O_8$, and methylamine, $CH_3.NH_2$, whereas the alkaloid first examined, when similarly treated, gave apparently the same acidic substance and a base resembling pyridine, which was termed manconine.

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[5] *Pharm. Journ.*, 1891, [iii], **21**, 917.

[6] *Journ. Pharm. Chim.*, 1876, **24**, 25, and *Bull. Soc. Chim.*, 1876, **26**, 39.

[7] *Arch. f. Exp. Path. Pharm.*, 1882, **15**, 404.

It would seem probable that the varying results obtained in the above-mentioned investigations may be attributed, as Harnack (*loc. cit.*, p. 562) and others have suggested, to the use of barks from different species of *Erythrophlœum*, or possibly from varieties of the same species. This view has recently been corroborated by observations personally communicated to us by Mr. Iner C. Wickware, to whom we are indebted for the material employed in the present investigation and also for photographs from which the illustrations accompanying this paper were produced. The material supplied by Mr. Wickware was designated by him as " Nkasa Bark," but its identity with the so-called " Sassy Bark " (from *Erythrophlœum Guineense*, G. Don) was kindly confirmed by Mr. E. M. Holmes, F.L.S.

The extended use of " Nkasa " bark in the Congo for criminal purposes, and the great suffering thereby produced, which had been witnessed by Mr. Wickware, led him to bring the bark to our notice, as it was hoped that a study of its constituents would render it possible to suggest a means of obviating the destructive effects of the poison. Inasmuch as the alkaloid erythrophleine had hitherto not been obtained in a form which permitted of its more exact characterization, and the statements concerning it being also somewhat at variance, it was deemed desirable to subject the "Nkasa" bark to a further chemical examination. The results which have now been obtained are summarized at the end of this paper.

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[8] *Arch. Pharm.*, 1896, **234**, 561.

EXPERIMENTAL.

The material employed for this investigation was obtained from the Belgian Congo, West Africa, through the kindness of Mr. Iner C. Wickware, of the Christian Missionary Alliance, at Boma, to whom our best thanks may here be expressed. It was collected from living trees, and, as already noted, agreed in its characters with the recorded descriptions of the bark of *Erythrophlœum Guineense*, G. Don.

A small portion (10 grammes) of the ground bark was tested for the presence of an alkaloid with a positive result.

For the purpose of a complete chemical examination 72.9 kilogrammes of the coarsely ground bark were completely extracted by continuous percolation with hot alcohol. After the removal of the greater portion of the alcohol, 27.68 kilogrammes of a dark red, viscid extract were obtained.

A quantity (4.5 kilogrammes) of the above-mentioned extract was mixed with water and distilled in a current of steam, but it yielded no essential oil. After this operation there remained in the distillation flask a deep red, aqueous liquid (A) and a quantity of a viscid resin (B), which solidified on cooling. The resin was thoroughly washed with water, and the washings added to the main portion of the aqueous liquid.

Examination of the Aqueous Liquid (A).

The aqueous liquid was concentrated under diminished pressure, and then repeatedly extracted with ether. The ethereal liquid was washed, dried, and the solvent removed, when 12 grammes of a brown, varnish-like solid were obtained.

Isolation of Luteolin, $C_{15}H_{10}O_6$.

The above-mentioned ethereal extract was redissolved in ether, and the solution shaken first with aqueous ammonium carbonate, which, however, extracted but a small amount of amorphous, gummy material. It was then shaken with successive portions of aqueous sodium carbonate until nothing further was removed by this reagent. The sodium carbonate extracts were united and acidified, when a lemon-yellow, crystalline solid was precipitated. This was collected and recrystallized several times from dilute alcohol, when it was obtained in pale yellow, glistening needles, which melted and decomposed at 323°. The amount of pure substance thus isolated from 4.5 kilogrammes of the original alcoholic extract was 0.2 gramme, and therefore represented 0.0017 per cent. of the weight of the bark. On subsequently treating 12 kilogrammes of the extract in the manner already described, a further quantity (0.5 gramme) of the yellow, crystalline substance was obtained.

0.1012* gave 0.2338 CO_2 and 0.0350 H_2O. $C = 63.0$; $H = 3.8$.
0.0898* gave 0.2072 CO_2 and 0.0312 H_2O. $C = 62.9$; $H = 3.9$.
$C_{15}H_{10}O_6$ requires $C = 62.9$; $H = 3.5$ per cent.

The substance was readily soluble in aqueous sodium carbonate and sodium hydroxide, forming deep yellow liquids, whilst its alcoholic solution gave with ferric chloride an intense green color. It dissolved in concentrated sulphuric acid, yielding a yellow solution which gradually develops a green fluorescence. On heating the substance for some time with acetic anhydride, and subsequently removing the greater portion of the latter, a compound separated, which, when recrystallized from ethyl acetate, was obtained in fine, colorless needles, melting at 222°–224°. This compound was likewise analyzed.

0.1038 gave 0.2320 CO_2 and 0.0384 H_2O. $C = 60.9$; $H = 4.1$.
$C_{15}H_6O_6(CO.CH_3)_4$ requires $C = 60.8$; $H = 4.0$ per cent.

From the above results it may be concluded that the yellow substance possesses the empirical formula $C_{15}H_{10}O_6$, and that it contains four hydroxyl groups. These facts, together with the above-described characters, render it evident that the substance is luteolin, a tetrahydroxyflavone, which was first isolated from the so-called Dyer's Weed (*Reseda luteola,* Linné), and which also occurs in the leaves of *Digitalis purpurea,* Linné, being identical with the compound termed digitoflavone.[9]

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* Dried at 120°.

The ethereal liquid from which the luteolin had been removed by extraction with sodium carbonate, as above described, was next shaken with a solution of sodium hydroxide, which, however, removed practically nothing. On finally drying and evaporating the ethereal liquid, it yielded about 2 grammes of amorphous material, from which nothing definite could be obtained.

The deep red aqueous liquid which had been completely extracted with ether was subsequently shaken with successive portions of warm amyl alcohol, these extracts being then united, washed with a little water, and concentrated to a small volume under diminished pressure. The concentrated amyl alcohol extracts deposited nothing on keeping, but on the addition of toluene an amorphous, nearly colorless precipitate was formed, which, when collected and dried on a porous tile, amounted to 25 grammes. This product was extremely soluble in water, giving a deep red solution, from which sodium carbonate precipitated a brown, amorphous solid, soluble in an excess of the reagent. The solid substance was found to contain traces of nitrogen, but nothing definite could be isolated from it. In order to ascertain whether it was glucosidic in character, a portion was heated for some time with 5 per cent. sulphuric acid. During this operation a large amount of resinous matter separated, which was subsequently removed by filtration, and the clear, acid liquid then extracted with ether. The ethereal liquid yielded, besides some amorphous material, a very small amount of a crystalline substance, which was identified by its melting point and reactions as gallic acid. The aqueous, acid liquid was finally deprived of sulphuric acid by means of baryta, concentrated, and examined for sugar, but with a negative result. It was therefore evident that the above-described solid was not glucosidic.

The original aqueous liquid (A), after having been extracted with ether and amyl alcohol as described above, still retained a deep red color, and gave slight precipitates with the usual alkaloid reagents. A small portion of the liquid was treated with basic lead acetate, which produced an abundant, dark colored precipitate, and the mixture filtered. The filtrate was deprived of lead by means of hydrogen sulphide, again filtered, and concentrated to a small volume. It was found to contain a considerable quantity of sugar, which yielded an osazone melting and decomposing at 210°. The basic lead acetate precipitate was suspended in water, decomposed by hydrogen sulphide, and the mixture filtered. The resulting liquid evidently contained a large amount of tannin, and, although it gave precipitates with the alkaloid reagents and with sodium carbonate, nothing definite could be isolated from it. There was no indication of the presence of a glucoside.

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[9] *Ber. d. deutsch. chem. Ges.*, 1899, **32**, 1184.

The main portion of the aqueous liquid was carefully neutralized with sodium carbonate, when a brown, amorphous precipitate was deposited, which, after being collected, washed with water, and dried, amounted to about 15 grammes. This product contained nitrogen, but it was very indefinite in character. It was insoluble in water and dilute mineral acids, as also in ether or chloroform, and was only sparingly soluble in alcohol. It dissolved readily in alkalies, giving a deep brown solution. When warmed with dilute hydrochloric acid, the liquid gave no reaction with alkaloid reagents. All attempts to prepare derivatives from it led only to the formation of resinous substances.

Isolation of the Alkaloid, Erythrophleine.

The aqueous liquid from which the above-mentioned brown, amorphous product had been separated, was made strongly alkaline with sodium carbonate and repeatedly extracted with ether. These extracts were united, washed with a little water, then dried, and a current of dry hydrogen chloride passed into the ethereal liquid. The alkaloid present was thus precipitated as a viscid hydrochloride, from which the ether was removed by decantation. The hydrochloride, amounting to about 1 gramme, was dissolved in a little alcohol, and ethyl acetate added, but no precipitation ensued. On subsequently evaporating the liquid to dryness in a vacuum desiccator over sulphuric acid, the salt was obtained in the form of a brown, scaly solid, which was soluble in water and responded to the tests for an alkaloid with the usual reagents. In order to further purify this product, it was redissolved in water, and aqueous sodium carbonate cautiously added until the precipitation of the base was complete. The mixture was then extracted with ether, filtered to remove some insoluble resinous matter, and the ethereal liquid again treated with dry hydrogen chloride. The gummy hydrochloride thus obtained was dissolved in ethyl acetate containing some alcohol, and the solution then evaporated at the ordinary temperature under diminished pressure over sulphuric acid. In this manner the alkaloidal salt was obtained as an almost colorless, amorphous solid, amounting to 0.6 gramme. It was readily soluble in water or alcohol, and was extremely hygroscopic, becoming gradually converted into a brown, transparent, glutinous mass. The free base, which has been termed erythrophleine by previous investigators, was a colorless, amorphous solid, readily soluble in ether, ethyl acetate, or alcohol, but insoluble in water. It yielded a bright yellow picrate, and an almost colorless gold salt, but neither of these derivatives could be obtained in a crystalline state.

The properties of erythrophleine, as described above, do not entirely agree with those recorded by Gallois and Hardy (*loc. cit.*), but are more in accordance with the later observations of Harnack.[10] A commercial specimen of erythrophleine hydrochloride, which was obtained by us from the same source as the product last employed by Harnack, was also similar in character to that described by him. It was a nearly colorless, amorphous powder, which on keeping in a closed tube gradually became converted into a brown, gummy mass. It dissolved readily in water, yielding a colorless solution, which was neutral to litmus and responded to the usual alkaloidal tests. On the addition of aqueous sodium carbonate the free base was precipitated as a gummy solid, which was insoluble in water or alkalies, but readily soluble in ether. The dry ethereal solution of the base, when treated with dry hydrogen chloride, yielded the hydrochloride in the form of a viscid oil and not in the original condition as an amorphous solid. Both the picrate and the aurichloride of the base were likewise amorphous. The amount of chlorine in this commercial specimen of erythrophleine hydrochloride was determined with the following result:

0.1652 gave 0.0462 AgCl. Cl = 6.9.
$C_{28}H_{43}O_7N.HCl$ requires Cl = 6.6 per cent.

Although the result of this determination is in approximate agreement with the formula assigned to erythrophleine by Harnack, it is evident that the substance is of too indefinite a character to permit of any deduction respecting its ultimate composition.

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[10] *Arch. Pharm.*, 1896, **234**, 561.

The aqueous liquid from which the erythrophleine had been removed, as above described, was made strongly alkaline with sodium hydroxide and extracted with various solvents, but no further quantity of alkaloidal substance was thus obtained. The proportion of alkaloid in the drug was therefore extremely small, since the amount of hydrochloride originally obtained (about 1 gramme) represented not more than 0.008 per cent. of the weight of bark employed.

Examination of the Resin (B).

The resinous material obtained from the original alcoholic extract of the bark, as previously described, formed, when dry, a dark brown, brittle mass, which could be reduced to a powder. It amounted to 1600 grammes, and thus represented 13.5 per cent. of the weight of the bark. For the purpose of its examination, 500 grammes of the resin were dissolved in alcohol, the solution mixed with purified sawdust, and the thoroughly dried mixture successively extracted in a Soxhlet apparatus with various solvents, when the following amounts of extracts, dried at 100°, were obtained:

Petroleum (b. p. 30–45°)	extracted	35.5	grammes	= 7.1	per cent.
Ether	"	26.0	"	= 5.2	" "
Chloroform	"	3.5	"	= 0.7	" "
Ethyl Acetate	"	26.0	"	= 5.2	" "
Alcohol	"	400.0	"	= 80.0	" "
	Total	491.0	grammes	= 98.2	per cent.

Petroleum Extract of the Resin.

This extract was a dark brown, soft, fatty solid. It was tested for the presence of an alkaloid, but with a negative result. The whole of the extract was then hydrolyzed by heating for a short time with an alcoholic solution of potassium hydroxide, after which the alcohol was removed, water added, and the alkaline mixture repeatedly extracted with ether. The ethereal extracts were united, washed, dried, and the solvent removed, when a quantity (20 grammes) of a reddish-brown, viscid solid was obtained.

Isolation of a Phytosterol, $C_{27}H_{46}O$.

The above-mentioned unsaponifiable material was distilled under diminished pressure, when a small quantity passed over below 260°/10 mm., but the greater portion distilled with slight decomposition above 300°/10 mm., a small final fraction being separately collected. The principal portion did not crystallize on cooling, but formed a viscid, transparent, yellow gum. A little of this substance, when dissolved in a mixture of chloroform and acetic anhydride, and a drop of sulphuric acid subsequently added, gave a reddish-brown coloration, rapidly changing to green, thus indicating the presence of a phytosterol. The gummy substance was therefore dissolved in hot alcohol, and the liquid cooled with vigorous agitation, when a colorless solid was gradually deposited. This was collected and recrystallized from alcohol, from which it separated in colorless, glistening leaflets, melting at 130–133°.

0.2378, on heating at 110°, lost 0.0112 H_2O. $H_2O = 4.7$.
0.1334* gave 0.4110 CO_2 and 0.1459 H_2O. $C = 84.0$; $H = 12.1$.

$C_{27}H_{46}O$, H_2O requires $H_2O = 4.5$ per cent.
$C_{27}H_{46}O$ requires $C = 83.9$; $H = 11.9$ per cent.

The above-described substance was evidently a phytosterol, and it gave the color reactions of that class of compounds.

The small final fraction obtained by the distillation of the unsaponifiable material yielded a phytosterol which crystallized in leaflets melting somewhat indefinitely between 135° and 142°. It would thus appear that more than one phytosterol was present in the distilled product, but the amount of substance was too small to permit of a more complete separation.

Examination of the Fatty Acids.

Isolation of Cerotic Acid, $C_{26}H_{52}O_2$.

The alkaline, aqueous solution of potassium salts, which had been extracted with ether as above described, was acidified with dilute sulphuric acid, and the precipitated fatty acids dissolved in ether. The ethereal solution was washed, dried, and the solvent removed, when a semi-solid residue was obtained, amounting to 12 grammes. This was distilled under diminished pressure, and two fractions collected, which passed over at 200–250°/12 $_{\text{mm.}}$, and above 250°/12 $_{\text{mm.}}$, respectively. The latter fraction rapidly solidified, and was purified by crystallization from ethyl acetate, when an acid was obtained which separated in minute, colorless needles, melting at 76–77°.

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* Anhydrous substance.

0.0657 gave 0.1895 CO_2 and 0.0796 H_2O. $C = 78.7$; $H = 13.4$.
$C_{25}H_{52}O_2$ requires $C = 78.8$; $H = 13.1$ per cent.

This substance was thus identified as cerotic acid.

The fraction of fatty acids distilling at 200–250°/12 $_{\text{mm.}}$ amounted to 6 grammes, and was evidently a mixture of saturated and unsaturated acids. It was therefore converted into the lead salt, and the latter treated with ether. The portion of lead salt which was insoluble in that solvent yielded the saturated acids, which, after recrystallization from alcohol, melted at 48–50°.

0.4208 required for neutralization 15.7 c.c. $\frac{N}{10}$ KOH. N.V. = 209.3.
$C_{16}H_{32}O_2$ requires neutralization value = 219.1.
$C_{18}H_{36}O_2$ requires neutralization value = 197.5.

It is thus evident that the saturated acids present in the above-mentioned fraction consisted of a mixture of palmitic and stearic acids, and apparently in about equal proportions.

The portion of lead salt which was soluble in ether yielded 3.5 grammes of unsaturated acids, which distilled at 215–225°/10 $_{\text{mm.}}$ These were analyzed, and the neutralization and iodine values determined, with the following results:

0.1753 gave 0.4950 CO_2 and 0.1836 H_2O. $C = 77.0$; $H = 11.6$.
0.5902 required for neutralization 20.2 c.c. $\frac{N}{10}$ KOH. N.V. = 192.0.
0.1096 absorbed 0.1449 iodine. Iodine value = 132.2.
$C_{18}H_{34}O_2$ requires $C = 76.6$; $H = 12.1$ per cent.
Neutralization value = 198.9; Iodine value = 90.1.
$C_{18}H_{32}O_2$ requires $C = 77.1$; $H = 11.4$ per cent.
Neutralization value = 200.4; Iodine value = 181.4.

It would appear from these results that the unsaturated acids consisted of a mixture of oleic and linolic acids.

Ether Extract of the Resin.

This extract was a brown, brittle solid, amounting to 26 grammes. It was digested with ether, when the greater portion passed into solution, while a small amount of a colorless powder remained undissolved. The latter was very sparingly soluble in alcohol, and when dissolved in chloroform, a little acetic anhydride added, and subsequently a drop of concentrated sulphuric acid, it gave a pink coloration, rapidly changing to blue and green. It also yielded an acetyl derivative, which separated in colorless leaflets, melting at 162–163°. From these characters it may be concluded that the sparingly soluble substance was the dihydric alcohol, ipuranol, $C_{23}H_{38}O_2(OH)_2$; but the amount obtained was not sufficient for analysis.

The above-mentioned ethereal liquid was shaken successively with dilute hydrochloric acid and aqueous solutions of ammonium carbonate, sodium carbonate, and sodium hydroxide. The hydrochloric acid removed only traces of a gummy base, which gave reactions with the usual alkaloid reagents, whilst the ammonium carbonate caused the precipitation of a small amount of a resinous solid of indefinite character. The sodium carbonate extract yielded, on acidification, a pale yellow solid. This was collected, and crystallized from dilute alcohol, when it separated in pale yellow needles, and gave a colorless acetyl derivative melting at 222–224°. It was thus found to be identical with luteolin, which had previously been isolated, as above described.

The final extraction of the ethereal liquid with sodium hydroxide yielded nothing but amorphous products, and on subsequently evaporating the ether only traces of a soft resin remained.

Chloroform, Ethyl Acetate and Alcohol Extracts of the Resin.

The chloroform extract of the resin was a dark brown, viscid solid, amounting to only 3.5 grammes, and nothing was isolated from it.

The ethyl acetate extract of the resin was a brown, viscid solid, which amounted to 26 grammes. In order to ascertain whether it contained anything glucosidic, it was heated for some time with a 5 per cent. solution of sulphuric acid in aqueous alcohol. On subsequently distilling the mixture with steam, no volatile oil or acid passed over. The distillation flask then contained, besides the aqueous liquid, a quantity of a viscid resin, which was collected, dissolved in alcohol, dried on purified sawdust, and the mixture extracted with ether in a Soxhlet apparatus. From this ethereal extract a small amount of a yellow, crystalline substance was obtained which proved to be identical with the previously described luteolin.

The aqueous, acid liquid, from which the above-mentioned viscid resin had been separated, was first extracted with ether, which, however, removed only a small quantity of gummy material. It was then freed from sulphuric acid by means of barium hydroxide, and finally concentrated under diminished pressure to a small volume. This liquid readily reduced Fehling's solution, and yielded an osazone melting and decomposing at 210°.

The results above described indicated the presence of a glucoside in the ethyl acetate extract of the resin, and it is probable that the small amount of luteolin which was isolated after the treatment with dilute sulphuric acid represented one of its hydrolytic products.

The alcohol extract of the resin was a brownish-black, brittle solid, which amounted to 400 grammes, and represented 80 per cent. of the total resinous material employed. It was completely amorphous, and as it appeared to undergo no change when heated with dilute sulphuric acid in aqueous alcohol, it evidently contained nothing of a glucosidic character.

Physiological Tests.

In order to determine the action of the extract prepared from *Erythrophlœum* bark, and of some of the products obtained therefrom, a number of tests were kindly conducted for us by Dr. H. H. Dale, Director of the Wellcome Physiological Research Laboratories, to whom our best thanks may here be expressed.

One gramme of the original alcoholic extract, representing about 2.6 grammes of the bark, was administered to a dog, when it caused continuous vomiting and a marked slowing of the heartbeat. One gramme of the total resinous material (= 7.4 grammes of bark) had much less effect, but caused some vomiting. A quantity of the water-soluble portion of the original alcoholic extract, representing 4 grammes of the bark, caused retching, without actual vomiting, and a distinct action on the heart.

The previously described amyl-alcohol extract of the aqueous liquid (*A*) was tested by dissolving 0.07 gramme of the respective extract in water, and injecting this intravenously into a rabbit, but it had no perceptible effect. The amount of substance employed represented about 13.6 grammes of the bark.

The brown, amorphous substance which was precipitated from the aqueous liquid (*A*) by its neutralization with sodium carbonate, as previously described, could not be tested by intravenous injection on account of its insolubility. A small quantity (0.25 gramme) of the product, representing about 216 grammes of the bark, was therefore given to a dog by the mouth, but no perceptible effect was produced.

The alkaloid erythrophleine, which was tested in the form of its hydrochloride, produced results similar to those obtained from a commercial specimen of this salt, which was examined for the purpose of comparison, and in both cases the action was such as has been described by previous observers. When given intravenously to a rabbit, 0.001 gramme of commercial erythrophleine hydrochloride caused marked slowing of the heart-beat, whereas with 0.002 gramme the same effect was followed by secondary quickening of the heart-beat, paresis, trismus, and finally death in convulsions in about half an hour. Similar results were obtained from the alkaloid isolated in the course of the present investigation, and 0.005 gramme of the hydrochloride of this base killed a small rabbit in less than five minutes. Both preparations of the alkaloid, when injected intravenously into pithed cats in doses of 0.0025 gramme, caused quite typical digitalis-like effects, the rise of blood pressure being large, and the heart passing through delirium to permanent systole.

Since the precipitate obtained by treating a small quantity of the water-soluble portion of the original alcoholic extract with basic lead acetate, when suspended in water and decomposed by hydrogen sulphide, yielded a liquid which possessed in a marked degree the characteristic erythrophleine action, it would appear that an appreciable amount of active substance had been precipitated by the lead salt. As already noted, however, nothing definite could be obtained from the lead compound, and for the purpose of isolating the alkaloid from the main portion of the original aqueous liquid (*A*) the latter was not subjected to treatment with basic lead acetate.

Summary.

The results of the present investigation of the bark of *Erythrophlœum Guineense,* G. Don, and the deductions therefrom, may briefly be summarized as follows:

A quantity of the bark was completely extracted with hot alcohol, and the resulting concentrated extract distilled in a current of steam, but it yielded no essential oil.

From the portion of the extract which was soluble in water the following substances were isolated: a very small amount of luteolin, $C_{15}H_{10}O_6$, and a small amount of an alkaloid which agreed in its characters and physiological action with erythrophleine, as described by Harnack (*Arch. Pharm.*, 1896, **234**, 561). Neither the alkaloid nor its salts could be obtained in a crystalline state, and they were therefore not considered suitable for analysis. The aqueous liquid contained, furthermore, besides some indefinite amorphous material, a considerable quantity of tannin, and a sugar which yielded *d*-phenylglucosazone, melting at 210°.

The portion of the alcoholic extract which was insoluble in water consisted of a dark brown, brittle resin, and represented 13.5 per cent. of the weight of the bark. From this product the following substances were obtained: a phytosterol, $C_{27}H_{46}O$ (m. p. 130–133°); cerotic, stearic, palmitic, oleic and linolic acids; and very small amounts of ipuranol, $C_{23}H_{38}O_2(OH)_2$, and luteolin, $C_{15}H_{10}O_6$. A portion of the latter compound was apparently contained in the resin in the form of a glucoside.

Inasmuch as the results of a preliminary test had indicated a much larger proportion of alkaloid to be contained in the bark than could subsequently be isolated, it appears probable that some change had taken place during the processes of extraction. This could not be more precisely determined on account of the very indefinite character of the base, which also precluded its further chemical study.

Since the bark under consideration is an exceedingly violent poison, and is largely used in West Africa for criminal purposes, it may finally be noted that the recognized and apparently most efficient antidote consists in the prompt administration of an emetic, or use of the stomach-pump, with subsequent stimulant remedies.

CUDBEAR AS A PHARMACEUTICAL COLORING.*

By George M. Beringer.

Since 1874, when Hans Wilder[1] directed attention to the advantages of cudbear over cochineal and carmine as a coloring agent for pharmaceutical preparations, it has become very popular and is now extensively used. As a vegetable dye miscible with either slightly acid or alkaline solutions with the production of acceptable shades of red, it has been used by many almost as a universal coloring where red colored liquids are wanted. Despite its extensive use and desirable tinctorial properties, one has but to note the criticisms in the pharmaceutical press to learn that it has not proved entirely satisfactory.

The principal complaint has been the lack of uniformity in the color of preparations as made by formulas in which the tincture of cudbear was directed. This tincture as found in the drug stores is exceedingly variable, due in part to the variability of commercial cudbear and in a large measure to the imperfect extraction of cudbear by the official N. F. formula.

This tincture is directed in a number of the National Formulary recipes, and in the revision now in progress it has again been decided to retain cudbear as a coloring agent. The desirability of adopting a method of standardizing the tincture is obvious and a sub-committee on color standards have been giving earnest consideration to this vexing problem.

A few of the suggestions offered for this purpose may be here mentioned. One of the earlier thoughts was the publication of a color chart with the shades designated by numbers and to indicate in the formula for a preparation the number of the shade that the product should match. A similar suggestion was to color silk thread or woolen yarn to the desired shades and chart and number these as guides. Tinted glass, especially that known as "ruby flash glass," was recommended for comparing acid solutions of cudbear. Tintometers were recommended, but these are beyond the reach of the average pharmacist and so not practicable. A novel proposition along this line was offered by Harvey I. Leith,[2] namely, that standard glass rods be prepared of definite diameter and length and colored in their manufacture according to standards established by the Committee on National Formulary, each rod to have a groove at the top bearing a tag with a number indicating the color. A rod of the standard tint dipped into a preparation would not be discerned if the coloring matched; if the rod showed it would indicate that the preparation was off in color. None of these suggestions were found to be practicable. The question naturally arises as to the proper directions that would have to be given in such schemes to insure the manipulator matching the shade.

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* Presented at the meeting of the New Jersey Pharmaceutical Association, Atlantic City, N. J., June 5, 1912.

[1] American Journal of Pharmacy, 1874, 299.

A more promising line of work has been the attempt to standardize dilutions of cudbear tinctures against chemical solutions of definite strength and color such as solution of iodine, solution of gold tribromide or an alkalized phenolphthalein solution. The latter, a suggestion of Mr. Otto Raubenheimer, has been more favorably considered by the Committee, and will be more particularly referred to later on. Other methods suggested have been chemical, such as the determination of the tinctorial value by the amount of sulphurous acid or solution of sodium hypochlorite required to bleach out a specified volume of the tincture previously well diluted.

Chairman Diehl[3] is undoubtedly correct in his opinion "that any other than the simplest method of standardization will prove disastrous since it is not likely to be carried out by the average pharmacist." His suggestion was[4] "that comparison of the diluted tincture should be made with dilutions of the purest attainable form of the real active coloring principles." Prof. H. V. Arny[5] states that "orcein, the active principle of cudbear, was found to be of uniform tinctorial power and a solution of orcein 1 to 40,000 was found to match a dilution 1 to 100 of a sample of tincture of cudbear."

If a purified cudbear or a satisfactory extract thereof of a uniform quality could be readily prepared, then the problem of standard red colored solutions would be simplified. Still better would be the isolation of the coloring principles in a reasonably pure condition. A tincture made with a definite proportion of such extract or coloring principle should not vary greatly and only slight difference of shades could exist in the preparations colored therewith. In the investigations of the writer, he has endeavored to keep this thought continuously in mind and his experiments have been largely directed thereby.

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[2] *American Druggist*, 1910, 175.

[3] A. Ph. A. Bulletin, 1909, 379.

[4] A. Ph. A. Bulletin, 1910, 371.

[5] A. Ph. A. Bulletin, 1910, 371; also *Practical Druggist*, 1912, 24.

Cudbear is one of the interesting group of dyes, orchil, cudbear and litmus that are commercially produced from various lichens. Lichens contain in their tissues a number of different coloring principles and E. Bachmann,[6] who studied this subject, distinguished by micro-chemical reactions sixteen different pigments, including greens, yellows, browns and reds of various shades. Moreover, various lichens contain colorless acids and ester-like compounds of orcin and closely related substances which through the action of alkalies, air and water, split to produce first *orcin,* which is itself colorless, but by the continued action of ammonia and air is converted into *orcein* and other colored substances. In former times, the ammonia needed was supplied by the use of stale urine. It is to be hoped that, with the modern methods of obtaining ammonia, this disgusting process is no longer practiced; yet the odor obtained from some samples seem to indicate the possibility of its continuance. By the use of different species of lichens and modification of the process and of the alkali used, different end products are produced resulting in the commercial dyes named.

Cudbear is stated to be prepared principally from certain species of Lecanora and Variolaria. Lecanora tartarea of northern Europe is said to be the source of most of that in the market and hence this species has been named the cudbear plant or cudweed. The name cudbear was given to this dye in honor of Dr. Cuthbert Gordon, who introduced it as a dye into Great Britain in the latter half of the eighteenth century. As a dye it is indifferent to cotton but valuable in the dyeing of wool and silk.

As a commercial product it is very prone to adulteration and in pharmacy its use should be restricted to a selected article that has been carefully tested and found to comply with the standard adopted. While good cudbear yields an ash of from 5 to 12 per cent., some samples examined gave an ash equivalent to 30 per cent. This consists very largely of sodium chloride which is a common adulterant and which, according to Allen,[7] "is sometimes added to reduce an unusually rich article to a uniform standard of quality." In one sample the writer found such an abundance of salt present that a portion crystallized out on evaporating the ammoniacal solution as directed in Hankey's process for tincture of cudbear.

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[6] *Pringsheim's Jahrbucher,* vol. xxi, p. 1.

As the coloring of cudbear is only slightly soluble in cold water I strongly advocate that all cudbear used for pharmaceutical purposes be first washed with at least five times its weight of cold water. On mixing cudbear with this amount of cold water and allowing it to macerate for a few hours with occasional agitation before filtering, the aqueous solution removes most of the sodium chloride, some ammonium salts with their empyreumatic odor, as well as some organic products that are undesirable, such as undecomposed lichen acids, partly converted orcin and extractive. The washed cudbear is more readily extracted and loses scarcely any of its real tinctorial power. This is a simple refinement that should be introduced no matter what formula be adopted for the preparation of a standard tincture.

Tincture of Cudbear and Its Standardization.

It is impossible to entirely exhaust cudbear of its coloring, and in the preparation of the tincture it is safe to assert that the amount directed in the N. F. formula for Tinctura Persionis, 125 gms. in the liter, is not half extracted and that an equally satisfactory preparation would result if the cudbear be reduced one-half and hereafter a tincture of not over 10 per cent. drug strength should be directed.

The directions for the manipulation in the N. F. read exceedingly simple: "Pack the Cudbear in a suitable percolator, and percolate it with a mixture of one (1) volume Alcohol and two (2) volumes of Water until 1000 c.c. of Tincture are obtained."

Cudbear is a most troublesome substance to percolate. It is difficult to moisten evenly and not infrequently a portion becomes pasty and other portions scarcely moistened, with the result that one is prone to obtain either channelling and uneven extraction or more frequently clogging of the percolator which may even completely stop the process. Consequently, if percolation is to be adopted, the plan of admixing with the cudbear an inert diluent must be resorted to. A number of substances, such as sand and ground pumice, which usually serve for this purpose with other refractory drugs, have not proved satisfactory with cudbear. In my experience ground cork has proved entirely satisfactory, about one-third to one-half of the weight of the cudbear being sufficient. The commercial ground cork of the factories, however, should not be used as this is made from the cork refuse and siftings and is full of foreign matters and dirt and has a musty odor. Unsightly corks, or even old corks, if thoroughly cleansed by boiling with water and drying, will serve the purpose and these can readily be reduced to a powder passing through a No. 20 to a No. 40 sieve by the use of an almond grater, a useful implement that should be in every drug store and laboratory.

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[7] Commercial Organic Analysis, vol. iii, pt. 1, p. 324.

The official menstruum is likewise too weak in alcohol to serve as a solvent for the coloring matters present. Water alone is a poor solvent for these and alcohol is one of the best, and if the menstruum is to be hydro-alcoholic then a mixture of, at least, alcohol 3 volumes water 1 volume is to be recommended. The coloring principles present in cudbear are, at least in part, associated as ammonia compounds and some are not soluble even in alcohol until alkali be added. Orcein, the most important dye constituent of cudbear, as found in the market, is but indifferently soluble in alcohol and its color is not fully developed unless ammonia or other alkali be present. Hence, ammoniacal extraction of cudbear seems to be indicated, and, when the extraction is so made then the alcohol can be reduced to the amount needed as a preservative. This is the principle that has been followed in the formula for tincture proposed by Wm. T. Hankey.[8] His formula is cudbear 125 gms., macerate for 36 hours in a mixture of ammonia water 125 c.c. and water 1875 c.c., shaking at intervals, then filter and wash the residue on the filter with water until 2000 c.c. of filtrate is obtained. Evaporate the filtrate to 500 c.c., then add 330 c.c. of alcohol and sufficient water to obtain 1000 c.c. of tincture. This is a decided improvement on the present N. F. formula, but the extraction of the cudbear is far from complete, the ammonia directed being insufficient for this purpose.

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[8] A. Ph. A. Bulletin, 1908, p. 93.

Moreover, tincture made by this formula shows a tendency to precipitate.

It has been proposed to adopt the Hankey formula in this revision of the National Formulary[9] with the modification that the tincture is to be standardized by the method proposed by Mr. Raubenheimer. The directions being that 1 c.c. of the concentrated ammoniacal extract mixed with 399 c.c. of water and 1 drop of 1 per cent. solution of ammonia should match the color of the Standard Pink Phenolphthalein Solution. The Standard Pink Solution is to be prepared by mixing 1 c.c. of Phenolphthalein T. S. U.S.P. with 2 drops of Solution of Potassium Hydroxide and sufficient distilled water to make 100 c.c.

If these match, the dilution with alcohol and water is carried out as directed in the formula. If they do not correspond, then the amount of the cudbear solution required to match the standard is determined by a repetition of the color comparison and the proper degree of dilution or concentration is thus fixed. The standard tincture should be of such a strength that 1 c.c. diluted with 199 of water should match the standard pink phenolphthalein solution.

The writer experimented with standard color test solutions as proposed by Raubenheimer[10] and also with the solution of orcein 1 to 40,000 as proposed by Arny.[11] The latter had a more decided red tint than the dilution of the cudbear tincture prepared by the proposed formula and was more difficult to match. With some of the samples of tincture made by other formulas the dilution did not match the tints of either of these proposed standards. It is apparent that while the amount of alkali directed to be added to the cudbear dilution (1 drop of 1 per cent. solution of ammonia) may be sufficient to develop the purplish tint desired in a tincture made by ammoniacal extraction, it would be inadequate for such a purpose in tinctures made by other formulas. This was all the more evident in the stronger tinctures resulting from my experiments. In some of these a nearer approach to an exact matching of tints was obtained by a modification of Raubenheimer's standard made by increasing the alkali and diminishing the phenolphthalein; thus 1 c.c. of solution of potassium hydroxide, .2 c.c. of phenolphthalein T.S. and distilled water sufficient to make 100 c.c. Using all three of these solutions for comparison, it was found difficult to accurately match some of the dilutions of the tincture. Comparisons were more readily made, however, if the standards were diluted to 200 c.c. or one-half of proposed strength.

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[9] Bulletin of N. F. Committee No. 31, p. 363.

[10] Bulletin Committee on N. F. No. 31, p. 364.

[11] *The Practical Druggist*, 1912, April, p. 24.

While these standards may serve the purpose for the comparison of tinctures made by the proposed N. F. formula, they are not entirely satisfactory and they are of questionable value in determining the strength of cudbear tinctures made by other processes. In some of these, the directions given must be deviated from, at least by the addition of more ammonia, and then it becomes difficult to determine in each case the exact amount of alkali that is required to produce the purplish pink tint to match that of the standard. An excess of alkali will produce a deep purple not at all comparable with the standards that have been proposed.

In order to make comparison of different tinctures, the writer surmised that if sufficient alkali be added to the diluted tinctures to produce the full purple coloration then the strength of such dilution should be readily and more accurately estimated. Such a method would necessitate the selection of a standard purple solution of known value. It was hoped that the Arny Orcein solution of 1–40,000 upon the addition of alkali would serve the purpose, but on trial it was found that the shade of purple it produced varied too greatly from that of cudbear solutions to be at all satisfactory. This is explained by the fact, as will be shown later, that the other color substances associated with orcein in cudbear materially influence the colors produced by the tincture and that they cannot be ignored. It is possible that a dilute solution of potassium permanganate may serve for such standard.

From the cudbear selected for the experiments, a number of samples of tincture of cudbear were prepared by different formulas. In all of these 125 gms. of the Cudbear was used to the liter of tincture so as to make the comparison with the formula of the N. F. III fair. The cudbear was previously washed with 5 times its weight of water before extraction and ground cork used as the diluent. The products were tested by determining the amount necessary to be diluted to 100 c.c. to match as near as possible the proposed standards. Subsequently, a practical test was also added, the determination of the amount of each necessary to color 100 c.c. of Aromatic Elixir, U.S.P., to a uniform color; 1 c.c. of the sample made by the N. F. III formula being used as the basis of this test. The following tabulated statement shows the results:

No.	Formula.	Arny Orcein Standard.	Raubenheimer Standard Phenolphthalein Pink Solution	Beringer Modification	To color 100 c.c. Aromatic Elixir.
1	National Formulary III	3 c.c. after adding 3 drops NH_3 (1%)	2.4 c.c. after adding 5 drops NH_3 (1%)	2.2 c.c .after adding 5 drops NH_3 (1%)	1. c.c.
2	Hankey's Recipe	2 c.c. after adding 2 drops NH_3 (1%)	1.7 c.c. after adding 3 drops NH_3 (1%)	1.5 c.c. after adding 2 drops NH_3 (1%)	.8 c.c.
3	Menstruum—Diluted Alcohol	1 c.c. after adding 2 drops NH_3 (1%)	.8 c.c. after adding 2 drops NH_3 (1%)	.6 c.c. after adding 4 drops NH_3 (1%)	.3 c.c.
4	Menstruum—Alcohol 3 vols. Water 1 vol.	.8 c.c. Tint not well matched	.5 c.c. after adding 2 drops NH_3 (1%). Difficult to match exactly.	.5 c.c. after adding 2 drops NH_3 (1%) not exactly matched.	.2 c.c.
5	Menstruum—Alcohol	1. c.c. Dilution cloudy and difficult to match exactly by addition of NH_3	.65 c.c.	.65 c.c.	.22 c.c.
6	Menstruum—Stronger Ammonia Water 25 c.c. Alcohol 975 c.c. Finish with alcohol	1.2 c.c. Dilution too purple and comparisons approximate only	.8 c.c.	.9 c.c.	.25 c.c. Not same tint.
7	Menstruum—Ammonia Water U. S. P. 1 vol. Water 3 vols. Percolate 4000 c.c. Evaporate to 750 c.c., when cold add alcohol 250 c.c. and water qs. to make 1000 c.c.	.8 c.c.	.57 c.c. good match	.6 c.c. good match	.2 c.c.
8	Mix the cudbear with Hydrochloric Acid 25 c.c., allow to dry and then percolate with alcohol to 1000 c.c.	.5 c.c. after adding 4 drops NH_3 (1%)	.5 c.c. after adding 4 drops NH_3 (1%)	.5 c.c. after adding 4 drops NH_3 (1%)	.2 c.c.

While these experiments do not permit of the exactness of determinations made by the methods of chemical analysis, they are nevertheless sufficiently instructive to permit of the following deductions: The present N. F. formula gives the poorest preparation, for the reasons explained. The formula proposed for the revision is not the best that can be devised and does not extract the cudbear nearly as thoroughly as can be done by percolation with ammonia water as in formula No. 7. If the N. F. is to adopt a formula in which the extraction is to be made with ammonia water then formula No. 7 is to be commended. The great increase in tinctorial power obtained by using a menstruum of proper alcoholic strength is proved, and if alcoholic extraction is to be the basis of the official formula, then formula No. 4 should be approved.

Formula No. 8 is based upon the principle of neutralizing the alkaline bases present in the cudbear and then extracting the liberated colorings with alcohol. The results are pleasing, the preparation is perfectly clear and keeps without change, which cannot be reported of the samples made by ammoniacal extraction, which after keeping for several months, show more or less tendency to precipitation. The product shades toward a brick-red on account of the free acid present, but on dilution gives a bright red to cherry-red. While the acidity might prove objectionable in some preparations, the results indicate a method of using cudbear to advantage in some solutions where the trace of acid is not contraindicated.

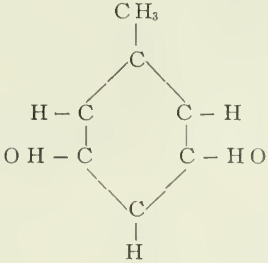
THE COLOR CONSTITUENTS OF CUDBEAR.

The text-books quite commonly are contented with the statement that the principal coloring substance present in Orchil and Cudbear is *Orcein*. Still more common is the misleading statement that *Orcin* in the presence of ammonia and air produces a colored substance *Orcein*. No mention is made of any other colors produced by such exposure or oxidation and so generally the value of cudbear as a dye has been attributed entirely to the orcein content. The attempt to standardize cudbear and its tincture have likewise, in a large measure, taken the direction of comparing these with standard solutions of orcein. The assumption here again was that orcein represented all that was valuable or essential in cudbear as a coloring for pharmaceutical preparations. If such assumption was correct then the problem of obtaining uniform colored solutions with cudbear could be readily solved by the use of solution of *Orcein*.

My experiments on the color constituents of cudbear were primarily undertaken with the thought of formulating a practical method of isolating the orcein in a state of sufficient purity to be used satisfactorily as a coloring in pharmacy. I have found it a most fascinating field of study, associated with peculiar and bewildering difficulties. The time at my command has not permitted of a thorough investigation of the colors isolated and the incompleteness of the investigation is admitted. Some of the results and conclusions are presented in this communication. It will be impossible to give herein all of the methods tried and much of the details of the experimentation is necessarily omitted.

The studies of E. Bachman [6] indicate the complexity of the study of the lichen pigments. The numerous organic acids present in this family are in nature's laboratory largely converted into orcin. These acids have been the subject of elaborate investigations by many of the most prominent European chemists. The facility with which they form esters further complicates the study and must affect the colored products resulting from their oxidation and present in the commercial dyes.

Orcin is not only present in many of these lichens, but is increased in the process of manufacture of the dye by splitting up the organic acids and compounds by heating with alkali. It can be produced by a number of processes, and when pure appears in colorless, sweet tasting crystals containing water of crystallization and melting at 58° C. It is soluble in water, alcohol and ether.[12] Chemically, Orcin is dihydroxy methylbenzene or Dioxytoluol $C_6H_3(CH_3)(OH)_2 + H_2O$.



Its close relationship to benzene shows that nature had anticipated man in establishing in her laboratory dye factories that simulated the process of the aniline dye chemists. The manufacturers of the lichen dyes have produced the same coloring materials from natural sources that can be duplicated in the chemists' laboratory by modern synthetic methods from definite chemical compounds. A priori, one could readily predict that orcin would yield a number of substitution compounds besides *orcein*.

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[12] *Schmidt Pharm. Chem.*, 1012.

Robiquet[13] was the first to observe that orcin in the presence of air and ammonia yielded a dye and named this body *Orcein.* This was further studied by Heeren[14] and Dumas[15] and Kane.[16] It was learned that orcein could be readily produced by exposing slightly moistened orcin in a watch crystal over a vessel containing strong solution of ammonia until it became brown and then dissolving this in water with the aid of a few drops of ammonia water and from this solution the orcein was precipitated by acetic acid.

From commercial orchil, orcin can be produced by moistening with hydrochloric acid, drying and then extracting with boiling alcohol. The alcohol is distilled off and the residue washed with water and then with ether when a carmine red powder remains.[17]

According to Liebermann[18] two dyes are produced by the action of air and ammonia on orcin, both being brown amorphous substances with green lustre. The one which is the chief product when the ammonia is in excess is the least soluble in alcohol and ammonia.

Especially worthy of note was the investigation of Zulkowski and Peters[19] who found that on allowing orcin to stand for two months over ammonia that three different dyes were produced: (1) Red orcein, which crystallized from hydro-alcoholic solution in microscopic crystals which yield a brown powder. The solution in alcohol is carmine red and with alkalies and alkaline carbonates gives a blue violet color. It is insoluble in water and ether, soluble in alcohol and acetic acid and acetone. (2) A yellow crystalline dye material which is soluble in warm water, alcohol and ether, giving a yellow colored solution. (3) A lackmus-like dye, amorphous and insoluble in alcohol.

These authors showed that these three bodies would be produced in three days by mixing 100 parts of crystallized orcin, 200 ammonia water (22 per cent. NH_3) and 1200 of hydrogen dioxide 3 per cent. The violet mass resulting is then acidified with hydrochloric acid, the precipitated Orcein is collected and washed with water until no longer acid and then dried at a moderate temperature. On concentrating the filtrate and wash water and adding sodium chloride a second precipitate of orcein can be obtained. On washing the orcein with ether the yellow dye is removed. The orcein is dissolved off the filter by boiling alcohol and there is left on the filter a lackmus-like dye material insoluble in alcohol. On evaporating the alcoholic solution of orcein it is obtained as brown crystalline powder. If water be added during the evaporation the orcein is left in glistening flakes.

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[13] *Ann. Chem. and Phys.* (2), 47, 238.

[14] *Schweigger's Journ. of Chem.*, 59, p. 313.

[15] *Ann. Chem. Pharm.*, 27, 145.

[16] *Ann. Chem. Pharm.*, 39, 25.

[17] See *Die Chemie der Natürlichen Farbstoffe,* Dr. Hans Rupe, to which I am indebted for many of these references.

[18] *Ber. d. deutsch. Chem. Ges.*, 7, p. 247; 8, p. 1649.

[19] *Monatsh. f. Chem.*, 11. p. 227.

The method of Zulkowski and Peters with ammonia and hydrogen dioxide was tried on a small scale, using Merck's orcin and the proportion of ingredients as stated. After allowing the mixture to stand for five days, the purple colored mass was acidified with hydrochloric acid and the precipitated orcein washed on to a filter with distilled water and the washing continued until the filtrate was free from acid. The filtrate was still of a bright red color and was washed with several portions of ether; the latter became a deep orange color and yielded on evaporation a reddish orange residue, and this was no doubt the yellow described by these authors. A small portion of this orange residue was soluble in chloroform and the chloroform was colored a distinct yellow, not orange, and the residue from evaporation of the chloroform was much lighter in color and had much less tinctorial power. This would indicate that the yellow of these authors was composed of two compounds, the one soluble in chloroform and the other scarcely soluble in chloroform, but very soluble in ether and present in relatively large amount.

The chloroform soluble yellow gave with ammonia a lilac-pink and with hydrochloric acid a light yellow coloration. With alcohol the solution was yellow. It dyed silk in ammoniacal bath only an indistinct faint light pink and in acid bath a maize yellow. For wool it had little affinity, and failed to dye in alkaline bath and in acid bath only a very pale yellow. The tinctorial value of this yellow was very slight. Owing to the small amount of material obtained the results were not satisfactory.

The orcin orange, the ether soluble yellow, in contradistinction gave orange colored solutions in water and alcohol. With ammonia it gave a bright violet color and hydrochloric acid changed this to light scarlet-yellow. The tinctorial strength was very marked. In acid bath it dyed both silk and wool a deep rich mandarin orange and in ammoniacal solution silk was dyed a salmon pink.

The precipitated *orcein,* after washing free from acid, was dried on the filter and then washed with ether. The ether extracted considerable of the yellow dyes which had been carried down with the orcein and these reacted the same as that obtained from the wash water. The orcein was then extracted by washing the filter with hot alcohol and on evaporation the alcohol solution yielded a glistening residue which gave a red-brown powder. There still remained on the filter a very small amount of precipitate not soluble in the alcohol. This gave with alkalies a distinct litmus-like blue and with acids a red and corresponds to the "lackmus-like" dye reported by Zulkowski and Peters.

The orcein so obtained was almost insoluble in water and ether and with alcohol gave a deep carmine red-colored solution and in acetone a cherry red. With alkalies it gave a blue-purple and with hydrochloric acid a red coloration. It possessed strong tinctorial properties and dyed silk in acid bath Bordeaux red and in alkaline bath purple. It dyed wool in acid bath a brownish-red and in alkaline bath a violet blue.

The wash water from this experiment was still of a deep red color even after having twice precipitated the orcein and washing with ether to extract the yellows and showed that it still retained much coloring. It was washed with warm amyl alcohol, which removed nearly all of the coloring, leaving the wash water only slightly colored. The amyl alcohol solution was separated and washed with water to remove dissolved salts and then evaporated on a water bath. It yielded a copious reddish purple residue. This was soluble in water and more readily in alcohol, giving red-purple solutions. With ammonia the solution becomes intensely purple and with hydrochloric acid a reddish purple. It possessed powerful tinctorial value and dyed silk and wool, either in acid or in alkaline baths, beautiful shades of purple. This dye appears to have escaped the attention of other investigators, although present in considerable quantity, probably because they failed to examine the wash waters. Provisionally we will name it *Orcin Purple.*

In order to determine the conditions under which orcin purple is formed and whether the presence of hydrogen dioxide influenced its production a few test tube experiments were tried. It was learned that orcin in the presence of potassium hydroxide and water yielded largely the yellow dye. In the presence of ammonia in excess and without any hydrogen dioxide being added and allowing the oxidation to proceed only two or three days and not to completion, all three dyes, red, yellow, and purple were produced, the yellow and especially the purple exceeding the amount of orcein. Moreover, that the purple dye was soluble in ether when in ammoniacal solution and could be partly recovered in this way even before acidifying and precipitating the red. Excess of ammonia and incomplete oxidation are conditions that are to be expected in the process of manufacturing cudbear. It will be thus seen that orcein is not the only product resulting from the oxidation of orcin. While the blue or lackmus-like dye and the yellow readily soluble in chloroform are present in such small quantity that they can probably be ignored, the orange is present in notable amount and modifies the color of the red with the production of brighter shades. Under certain conditions the orcin purple is produced in quantity sufficient to materially affect the color.

Before taking up the Zulkowski and Peters's paper and process for experimentation, the writer had tried a number of methods for separation of the color materials from cudbear and some of these merit recording. The original thought was to obtain the coloring by precipitation as a lake with a metallic salt. Lead subacetate was found to most completely precipitate the coloring.

Process A—50 gms. of cudbear, previously washed with 250 c.c. of cold water, was treated with successive portions of diluted ammonia water by maceration and the filtered solutions concentrated and solution of lead subacetate added so long as a precipitate was formed. The precipitate was washed by decantation and then on a filter until free from soluble lead salt. It was then suspended in water and a current of hydrogen sulphide passed through until the lead was entirely converted into sulphide. The mixture was then evaporated to dryness and the resulting mass powdered and divided into two equal portions. The one was extracted with warm alcohol and it was attempted to extract the other with diluted ammonia water. It was found, however, that the ammonia water softened the filter paper so that the lead sulphide passed through and even after repeated evaporations and resolution the lead sulphide persisted in the filtrate. The alcoholic solution from the other half was evaporated and yielded a red powder. The yield was exceedingly small and the tediousness of this process precludes its recommendation. The residue gave a bright red solution in alcohol and with ammonia gave a purple coloration. The alcoholic solution had a peculiar fluorescence. To ether it yielded a yellow dye, and from the ether extract water removed traces of a substance which, on concentrating the aqueous solution and adding potassium hydroxide, gave a pale yellow iridescent liquid with pale green and pink shadings. This was attributed to traces of organic lichen acids and similar reaction was obtained from the washings of the cudbear and from other extractions.

Process B—50 gms. of cudbear was washed as previously directed, mixed with 10 c.c. hydrochloric acid, dried and then extracted for 12 hours in a Soxhlet apparatus with alcohol. The extraction even then was not complete. The alcohol was distilled off and the residue evaporated to dryness on the water bath and reduced to powder. It was then of a purple-brown color and weighed 8 gms., equivalent to 16 per cent. of the cudbear taken. This will be referred to as extract by acid alcoholic process. Five grammes was purified by washing with water and then with ether as recommended in the published process. The ether was colored yellow and on evaporation gave the orange-yellow dye. Associated with it was a small amount of a violet-red dye that was insoluble in chloroform.

The purified extract was now of a dull red powder and weighed 1.75 gms., it gave with alkalies the blue-purple coloration and dyed silk and wool the orcein shades. In accordance with the published statement it should be orcein. It was, however, far from pure and, although made by alcoholic extraction, it was no longer entirely soluble in alcohol; a portion dissolved readily in alcohol and a smaller amount was very scarcely soluble even in boiling alcohol. This portion dissolved readily in ammonia water, yielding a purple solution, but when reprecipitated by the addition of acid its solubility in alcohol, even in this freshly precipitated state, was not increased. This portion was likewise much weaker in tinctorial value.

Process C—50 gms. of cudbear was washed as in previous processes, then mixed with 25 gms. of ground cork and percolated with a mixture of ammonia water 1 volume, water 3 volumes, until 3500 c.c. of percolate was obtained and the cudbear was fairly well extracted, although not exhausted. The percolate was concentrated to 500 c.c. and sufficient hydrochloric acid (25 c.c.) was added to make the solution decidedly acid, then warmed and set aside for 24 hours for the precipitate to settle. The precipitate was collected on a filter and washed till free from acid, then dried and powdered. It yielded a red-brown powder which gave a purple solution with alkalies, and dyed silk in acid bath a light purplish red, corresponding to what is listed by silk manufacturers as crushed strawberry, and in alkaline bath a red violet. This impure orcein we will designate as *Perseo Red.* It is composed of two red coloring substances, one soluble in alcohol with a carmine red solution, the other practically insoluble in alcohol but soluble in ammonia water, and the ammoniacal solution on evaporation yields a shining lustrous purple powder which is insoluble in alcohol, but soluble in diluted alcohol to deep purple red solution. The experience with these red dyes obtained in both processes B and C seems to confirm the statement of Liebermann[20] as to the existence of two red dyes produced by oxidation of orcin with ammonia and air.

The filtrate and wash water from the precipitated perseo red was concentrated and extracted with ether which extracted the yellow dye. Subsequent extraction with amyl alcohol yielded a brownish-red solution and on evaporating off the amyl alcohol there remained a lustrous brown powder. This was soluble in water and in alcohol yielding purple-red solutions which on the addition of ammonia became a brighter red but not purple. It dyed silk in acid bath a heliotrope and in alkaline bath an "old pink" shade.

In attempting to isolate the different coloring matters present in cudbear, either by precipitation or by the use of immiscible solvents, one must recognize the difficulty of their separation in an absolutely pure state. Traces of the associated colorings are almost sure to adhere and modify the shades produced in dyeing. Nevertheless, there are several well defined and distinct colors which are evidenced in every one of these methods and prove that in cudbear we have to deal with the orcin-like reds, a yellow and the purple in varying proportions. The samples of the isolated dyes, colored solutions and dyed silk and wool fibres demonstrate this.

In order to compare the strength of the red dyes obtained in the processes described they were compared with a sample of orcein as supplied by Merck & Co. This orcein was insoluble in water, chloroform, petroleum benzin and benzene. In alcohol it gave a carmine red solution and its solubility in alcohol was increased by the addition of a small amount of ammonia. With methyl alcohol it gave a carmine red solution, with acetone a scarlet, and amyl alcohol was colored deep pink. With ether it yielded a pale yellow solution, this filtered off gave with ammonia a violet and when acidified with hydrochloric acid was changed to a pink lilac color. It was noticed that on adding more ether, this at first remained colorless, but gradually became yellow as if some change was taking place in the presence of that solvent.

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[20] *Ber. d. deutsch. Chem. Ges.*, 7, p. 247; 8, p. 1649.

Solutions of each of these red dyes were prepared by using .050 gm. of the dye, 5 c.c. ammonia water and sufficient diluted alcohol to make 100 c.c. The Merck's sample was taken as the standard and for comparison 1 c.c. of its solution was diluted to 100 c.c. with distilled water. The results were as follows:

Merck's Orcein	Solution, clear, dark purple	1 to 100 c.c. Standard
A.—Red by Process A not purified beyond alcoholic extraction.	Solution, clear, lighter red-purple.	5 c.c. to 100 c.c.
B.—Purified red by acid extraction.	Solution, clear, purple.	2.25 c.c. to 100 c.c.
C.—Perseo Red.	Solution, clear, deep purple.	3 c.c. to 100 c.c.
D.—Orcein by Zulkowski and Peters' method.	Solution, clear, deep purple.	.8 c.c. to 100 c.c. Solution more blue as if trace of litmus present.

On acidifying dilutions of these solutions the red produced was similar to a litmus red; this was somewhat less marked in solution A. Aromatic elixir colored by these lacked the attractive brightness of cudbear coloring. It was concluded that orcein must have a limited field of usefulness in pharmacy and that it could not displace cudbear with satisfaction.

EXTRACT OF CUDBEAR.

Desiring to obtain a preparation that would represent all of the coloring present in cudbear, extracts were made. Preliminary experiments showed the necessity of washing the cudbear with cold water to remove salts before extraction if non-hygroscopic and powdered extracts were to be expected and in these experiments, this was always a preparatory act. Alcohol, acetic acid, ammonia water U.S.P., and a mixture of ammonia water and water 3, were all used as menstruums as well as the acid-alcoholic hot extraction previously referred to. It was found that the resulting extracts could be dried and powdered, but that they were not freely soluble in alcohol or water, and that with each, complete solution could be effected by the addition of ammonia.

For the comparison of these extracts solutions were made by the following formula: Extract .5 Gm., Ammonia Water 5 c.c., Diluted Alcohol sufficient to make 100 c.c. The tabulated statement exhibits the results. Efforts to compare these with the Arny and Raubenheimer Standard Solutions were not satisfactory and comparison was made by using the dilution of the solution of the alcohol extract as a standard.

Menstruum	Yield	Character of Solution	Amount required Match Standard.
Alcohol	8.3%	Solution complete, sediment very little.	1 c.c. to 200 c.c. standard.
Acetic Acid	11.2%	Poorly soluble and solution not completely effected.	8 c.c.
Ammonia Water	13.0%	Solution complete.	3 c.c.
Ammonia Water 1 Water 3	20.0%	Solution nearly complete.	2.5 c.c.
HCl and Alcohol	16.0%	Solution nearly complete.	4 c.c.

Aromatic elixir colored by any of these solutions was distinctly purple but the red coloring was readily produced by neutralizing with citric acid. The use of an extract of cudbear would very materially reduce the variability in color of preparations in which it was used and it would also be available for the preparation of a more uniform tincture. Acetic acid extract is ruled out on account of its poor solubility and lack of strength. On the score of economy ammonia water extraction appeals but on the basis of strength and reliability alcoholic extraction is to be preferred.

LIME-WATER.

By Herbert J. Watson, P.D.[1]

Lime-water, officially known as Liquor Calcis, is a solution of Calcium Hydroxide. The United States Pharmacopœia describes lime water as, "A saturated aqueous solution, which should contain not less than 0.14 per cent. of pure Calcium Hydroxide [$Ca(OH_2)$–73.56." It also states, "The percentage of Calcium Hydroxide varies with the temperature at which the saturated solution is prepared, being about 0.17 per cent. at 15° C. (59° F.), the percentage diminishing as the temperature rises."

In the preparation, the lime is directed to be slaked and washed by the gradual addition of water, equal to one-ninth the volume of the finished solution. Agitating at intervals and decanting the supernatant liquid, which contains the impurities, follows the slaking and dilution with the water.

Recent experiments, in the preparation of lime water, that I have made, prove that the solution of Calcium Hydroxide (official strength) may be had within fifteen minutes, if the lime is slaked in boiling distilled water. Small quantities of the water added sufficient to keep it moist. Washed on a filter with boiling distilled water. The washing may be repeated once or twice with more of the hot water. The filter paper is then perforated at the bottom and the entire amount of the cold water (15° C. or 59° F.) is used to wash the Calcium Hydroxide off the filter paper in the bottle. After violent agitation with the cold water, the solution was filtered for testing and 50 c.c. of this solution required 22.1 c.c. $\frac{N}{10}$ H_2SO_4 V.S. to neutralize the Calcium Hydroxide present (U.S.P. requires not less than 19 c.c. of the $\frac{N}{10}$ H_2SO_4 V.S. to neutralize 50 c.c. of the lime-water).

The same lime, as used in the above experiment, was slaked at 75° F. and tested after 5 hours standing required but 20.5 c.c. $\frac{N}{10}$ H_2SO_4 V.S. This shows a gain of 1.6 c.c. in favor of slaking with the boiling water. The intense reaction, taking place during the slaking with the heated water gave a much finer powder than with the water at room temperature. This fine powder gave a greater surface to the water, resulting in an increased solubility. The above solutions were agitated but once.

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[1] Read at the meeting of the Delaware Pharmaceutical Association, June, 1912.

The prepared lime in small bottles sufficient to make one gallon Lime-water U.S.P., I found to make a very strong lime-water. At room temperature, the solutions prepared from this special lime, were stronger than lime-water prepared from solutions of the stone-lime in cold water. It required 24.1 c.c. $\frac{N}{10}$ H_2SO_4 V.S. for 50 c.c. of this specially prepared lime-water.

Lime-water prepared from imported lime C.P. made an excellent solution. This preparation required 22.2 c.c. $\frac{N}{10}$ H_2SO_4 V.S. to neutralize 50 c.c. of the water prepared at room temperature.

The solution of Calcium Hydroxide, at various temperatures, is very interesting. The mistaken idea, that we so often hear our fellow pharmacists say, "Lime-water made from tap water, is just as good or will do," will not stand. Lime-water, prepared from tap or hydrant water, is not the official Liquor Calcis U.S.P. The Pharmacopœia, distinctly and definitely, prescribes distilled water (15° C. or 59° F.) and not tap or hydrant water at the prevailing temperature.

Water taking up sufficient Calcium Hydroxide (at 15° C. or 59° F.) to require 24.1 c.c. $\frac{N}{10}$ H_2SO_4 V.S. Solution at room temperature (21.7° C. or 71° F.) required 21.7 c.c. $\frac{N}{10}$ H_2SO_4 V.S. to 50 c.c. of the lime-water. The decrease of the Calcium Hydroxide is very small when the temperature rises over 71° F. Water at 100° F. was used for this preparation, and 21.4 c.c. $\frac{N}{10}$ H_2SO_4 V.S. were required for 50 c.c., resulting in .3 c.c. of a decrease under that prepared at room temperature.

The solution deteriorates rapidly upon exposure to the ordinary atmosphere. Even with electric lighting in the place of illuminating gas, the decomposition is rapid. Experiments show that Calcium Hydroxide in solution is reduced from 2 to 3 per cent. a day, when it is left unstoppered. In one solution, the lime-water was reduced from a 100 to a 21 per cent. solution in 8 days. In the presence of lime and the bottle left unstoppered, the lime-water was reduced to an 81 per cent. solution of Calcium Hydroxide in 6 days. The reduction of the lime-water, in this last instance, is followed by the carbonation of the lime and the entire mass is rendered inert.

I found one of the samples that I collected was undoubtedly due to this mistake of slaking the lime in a large earthenware jar with a loose lid. They permitted "the water to soak and thoroughly be saturated with the lime," as they termed it. This sample was about 13 per cent. strength.

The majority of the samples examined were identical in strength with those prepared with tap water. Few were strong, indicating special care in preparation from selected lime. With few exceptions the examination of the specimens throughout the State was very satisfactory. Very few of the samples taken were found below strength.

I expected, according to a previous paper to this Association on Lime-water, to find at least every other specimen below strength, but it was a pleasant surprise when I tested so many before detecting a sample that was not full strength.

A RAPID ACCURATE METHOD FOR THE QUANTITATIVE ESTIMATION OF CHLOROFORM IN CHLOROFORM LINIMENT.

By Joseph L. Mayer.

A member of the Revision Committee of the Pharmacopœia, recently called my attention to the advantage of making official a method for the quantitative determination of chloroform in chloroform liniment, and the lack of a published process for the same.

The subject being an important one, I began experimenting with the object in view of evolving a method whereby the pharmacist could easily and accurately make the estimation.

A method, which at first gave promise of yielding satisfactory results, was to precipitate the chloroform out of the liniment by means of 10 per cent. ammonium hydroxide and while the results obtained were satisfactory when the sample was of U.S.P. strength, when the quantity of chloroform contained in the liniment was less than 25 per cent. or more than 30 per cent., the results were too far from the truth to be of value. The method was therefore abandoned. An effort to throw out the chloroform by means of centrifugal force did not yield concordant results.

It soon became apparent that the soap in the liniment was the disturbing factor, and that to obtain satisfactory results it was necessary to distill the chloroform. Remembering this fact, the following method was devised:

Into a test-tube having a capacity of about 85 c.c. and about 25 mm. in diameter, place 10 c.c. of distilled water and 10 c.c. of liniment to be analyzed, accurately measured with a pipette; to prevent bumping, a small piece of pumice stone which has previously been heated to white heat and thrown into water is added. The test-tube is connected with a Liebig condenser by means of corks and bent tube. For a receiver use an accurate 25 c.c. cylinder graduated in tenths or fifths of a c.c. containing 5 c.c. distilled water. It is not necessary to have the condenser tube come in contact with the water. All that is required is to have it project into the cylinder. By means of a small naked flame, quietly distil the chloroform into the water contained in the cylinder. It is easy to know when the chloroform is all distilled by watching the receiving cylinder. As the chloroform distils it sinks to the bottom then comes a lighter distillate which remains on top and is perfectly clear and then a distillate which forms a milky layer occupying about 1 c.c.; after this turbid zone has appeared remove cylinder; stopper it with a sound cork and mix by shaking thoroughly; then remove the cork and add diluted sulphuric acid (10 per cent.) to the 25 c.c. mark and shake thoroughly. In a few moments the chloroform will have settled to the bottom in a clear layer and all that remains is to multiply the c.c. of chloroform by 10 to obtain the percentage of chloroform in the sample. The entire operation does not require over fifteen minutes.

The results obtained on a large number of samples of known but varying strengths, proved the method to yield such very accurate results, that should the Revision Committee decide to make official a method for the quantitative estimation of chloroform in chloroform liniment, it is suggested that they adopt this one.

Of course a description of the method for use in the Pharmacopœia could be very much shortened as I have purposely gone into detail in describing it.

In view of the accuracy of results, ease of application, and simplicity of apparatus, the method has everything to commend it.

I would take this opportunity of acknowledging my indebtedness to my assistant, Mr. I. Schwartz, for valuable aid rendered in connection with the work.

WEIGHTS AND MEASURES SHOULD BE GUARANTEED U.S.P. STANDARD.[1]

By Joseph W. England.

There is probably no more important need in the pharmaceutical world than the necessity of having accurate and uniform weights and measures, more especially measures of volume.

It is simply idle to standardize the potent remedies of the Pharmacopœia, with the greatest possible degree of accuracy, and then measure them with measures that are not accurately graduated.

As an illustration, three dozen 8 ounce graduates were purchased by Whitall, Tatum Co. in widely separated localities and compared with the standards used in their factory. The results were startling. They were as follows:

Not *one* of the 36 graduated measures was accurately graduated.

Some were better than others, but all were bad.

On one graduate, the 6 ounce mark was correct, but all the remaining marks were wrong.

In one lot of twelve graduates, 6 fluid drachms of liquid were required to reach the graduation marked ½ fluidounce, a variation of 50 per cent!

All graduates should be guaranteed by manufacturers, and marked:

"*Guaranteed U.S.P. Standard by ——;*" and pharmacists should buy no other. *It is fully as important that weights and measures be guaranteed to be of U.S.P. Standard as it is of drugs.*

A standard graduate should be made of good flint glass properly annealed and graduated, the usual types being conical, narrow cylindrical, and broad cylindrical. The best forms are of blown glass, not pressed glass. The annealing of the glass is done in lehrs or tempering ovens 75 to 100 feet long. The graduates go in at one end red hot, and in twelve hours come out at the other end cold, and properly annealed. It has been alleged that graduates may be tempered by placing them in cold water, bringing the water to the boiling point and cooling. But glass workers claim that such a method is of no practical value, as the temperature of the boiling water is not high enough to permit any great readjustment of the relative positions of the various molecules of the glass.

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[1] Read before the Pennsylvania Pharmaceutical Association, June, 1912.

The standard followed by Whitall, Tatum and Co., is 1 fluidounce = 29.5161 grammes of water when weighed in dry air at a temperature of 15° C., barometric pressure of 760 mm., the coefficient of expansion of the glass being assumed to be 0.000025 and the density of the brass weights 8.3. These figures are derived from the original data in use at the National Bureau of Standards of the United States, Washington, D. C., and the calculations are carried to any number of decimals necessary in the case of each instrument. The best method of graduation is that in which the graduates *deliver* the quantities indicated, every line in each graduate being determined by actual measurement. Where mechanical division is employed, the graduates will vary in delivery.

There should be no variation in the delivery graduates, other than that caused by the personal factor. In measuring liquids, the lower meniscus should be, of course, always observed; if the graduate is not held in a perfectly level position, more or less of the liquid will be measured, according as the graduate is tilted backward or forward.

Personal accuracy in the reading of graduates depends somewhat upon the diameter of the container at the point where the reading is taken. It is for this reason that the narrow cylinder is apt to yield more accurate results than the cones, and is preferred in the analytical laboratory; the cone is sufficiently accurate, however, for galenical work, and is more easily cleaned out.

The weights and measures recognized by the U. S. Pharmacopœia are derived from or based upon those of the metric system, as the United States National Prototype Standards of the Meter and Kilogramme in the custody of the National Bureau of Standards at Washington, D. C., and the system of Apothecaries' Weights and Fluid Measures are used almost wholly by the physicians of this country in prescribing and the pharmacists in dispensing. The use of the metric weights and measures is exceedingly limited, but it is growing.

According to the U.S.P. (VIII) P. LIII, the standard temperature for the solubility of substances in liquids, for taking specific gravity and for volumetric operations in the Pharmacopœia is 25° C. (77° F.); in the former revision it was 15° C. (59° F.). This change has been made on account of its greater convenience, and because it suited the greatest number of laboratory experts and pharmacists in the United States. In the case of alcohol and wine, however, the temperature of 60° F. (15.667° C.) was recognized, for the present, since all the laws and regulations of the United States, referring to alcohol and alcoholic liquids in general, are still based on this degree of temperature.

The standard temperature used by the glass manufacturer for graduating his measures is still 15° C., although it was changed in the eighth revision of the Pharmacopœia, from 15° C. to 25° C., as it will be probably in the ninth revision; but this error will be doubtless corrected by the manufacturers as soon as the temperature for the ninth revision has been decided upon.

The standard fluidounce of water used by the glass manufacturer in graduating his measures is: 1 fluidounce = 29.5161 grammes at 15° C. The standard of the U.S.P. (VIII) is 1 fluidounce = 29.5737 grammes at the maximum density of water (4° C.) in vacuo. This is a very small difference, when the expansion of the water from 4° C. to 15° C. is considered; and proper adjustments will doubtless be made as soon as the standards of the ninth revision become official.

The use of graduated prescription bottles should be discouraged. They vary greatly in accuracy, and their use is a delusion and a snare. They are blown in moulds, and vary in contents according to distribution of the glass in the mould. Sometimes this is more uniform, and sometimes less, and hence the quantities marked on such containers must be inaccurate. There is no substitute in prescription work for an accurately graduated measure.

In conclusion, it should be added that the American-made glass graduates, in accuracy and appearance, are superior to those made abroad, and much more likely to accord with the U.S.P. standard.

PHILADELPHIA COLLEGE OF PHARMACY, QUARTERLY MEETING.

The quarterly meeting of the Philadelphia College of Pharmacy was held June 24, 1912, at 4 P.M., in the Library. In the absence of the President, Howard B. French (who was in attendance as a delegate to the Republican National Convention at Chicago), Mr. George M. Beringer was called to the chair.

The minutes of the Annual Meeting held March 25th were read and approved. The minutes of the Board of Trustees for March 5th, April 2d, May 7th and 14th were read by the Registrar, J. S. Beetem, and approved.

Report of Committee on Membership: In the absence of the Chairman, Professor Charles H. LaWall, the report was read by J. S. Beetem. The report gives the number of Active, Associate, and Honorary members, makes some suggestions concerning delinquent members, and of measures to interest others to become members. The report was discussed by Messrs. Lowe, Beetem, Beringer, Stroup, Kraemer, Poley and Weidemann, when the recommendations were approved.

Committee on Necrology reported that during the year two active members, Doctor George R. Vernon and Clemmons Parrish, and one honorary member, Doctor Walter Wyman, had died.

Report of delegates to the New Jersey Pharmaceutical Association, presented by George M. Beringer. The meeting of the Association was held at Atlantic City, June 4–7. The delegates from the College were cordially received. The attendance this year was not as large as last year, as the subject of Legislation did not occupy so much attention. The program contained a number of interesting and instructive events. An illustrated lecture by F. B. Kilmer on the Collecting and Marketing of Crude Drugs; papers were read by Dr. C. B. Lowe, Prof. Charles H. LaWall, E. Fullerton Cook, Charles Barrett and George M. Beringer; Prof. Joseph P. Remington made a very interesting talk upon the progress made in the 9th Revision of the United States Pharmacopœia. The Travelling Men's Auxiliary arranged for the entertainment of the Association a German Saengerfest and dance, which was greatly enjoyed. This Association also has a progressive Ladies' Auxiliary Association. The meetings of the New Jersey Pharmaceutical Association are attended by delegates from the near-by Colleges of Pharmacy, and the fact that many of the members who are active in the work of Association are graduates of our College always insures for the delegates a hearty and cordial welcome.

In connection with this report Mr. Beringer said a wider publicity should be given about the Edward T. Dobbins scholarship (available to a student from New Jersey), and suggested that the Secretary of the College forward the necessary information to the Secretary of the New Jersey Pharmaceutical Association for publication in the Annual Proceedings. The suggestion was approved.

Historical Committee.—Mr. Beringer, for the Committee, said there had been no report prepared, as the work of the Committee was now very largely taken up by the Permanent Committee on Centenary and History of the College, and in view of this suggested that the two committees be merged until the Centenary Celebration, when on motion of Professor Kraemer the suggestion was agreed to.

Professor Kraemer presented for the Historical Collection some drawings, made by Mr. Ray H. Machesny and others of the graduating class, that had been used in the preparation of this year's Class Book. They showed sufficient merit and were considered worthy of preservation.

Report of delegates to the Pennsylvania Pharmaceutical Association, by Prof. C. B. Lowe. The 35th annual meeting was held at Buena Vista, Franklin County, Pa., on June 18, 19 and 20. The attendance was excellent. The first meeting was held on Tuesday morning, reports of officers and committees being in order. The formal opening being in the evening when President Lemberger made his address. The Committee on Papers and Queries, Prof. E. P. Stroup, Chairman, presented 37 papers, all of them interesting and some of them quite important. The members of the faculty and graduates of the College being largely represented among the authors. The prize of $20 in gold for the best paper presented at the previous meeting was awarded to Prof. Henry Kraemer for his paper on "Variations in the Forms of Vegetables." (See this JOURNAL, 1911, p. 365.) Great interest was taken in the proposed Pharmacy law, much opposition was manifested by many of the country members, but after being modified to a considerable extent it was adopted, and ordered to be introduced at the next meeting of the Legislature. The social features were up to the former high standards of the Association. A most unique affair was presented, entitled "A Night in Japan," which was a great success. The next place of meeting is Forrest Inn, Pike County. The new President is Prof. Louis Saalbach, of Pittsburgh.

Professor Kraemer proposed a candidate for honorary membership, which, according to the rules, lays over for action till the next meeting of the College. The President made the following appointments: Delegates to the Sixtieth Annual Convention of the American Pharmaceutical Association, Prof. Joseph P. Remington, Chairman, Prof. Henry Kraemer, Prof. C. B. Lowe, Adolph W. Miller, M.D., and George M. Beringer.

Committee on Nomination.—Prof. F. X. Moerk, Chairman, William E. Lee, William McIntyre, C. Mahlon Kline, and F. P. Stroup.

C. A. Weidemann, M.D.,
Recording Secretary.

Abstracts from the Minutes of the Board of Trustees.

March 5th. Eighteen members were present.

Committee on Property reported that a revision of Insurance rates had been effected which would make quite a saving for the College.

Committee on Announcement reported the issuing of the February Bulletin and that the April number of the Bulletin was in course of preparation.

Committee on Instruction reported further in the matter of a Special Bulletin. In view of the detail work necessary in this connection a special committee of three was appointed to assist, viz.: Prof. S. P. Sadtler, Joseph W. England and George M. Beringer.

Mr. England gave some information concerning the establishing of the Pacific Coast Scholarship in the Philadelphia College of Pharmacy. An amount of money has been placed in the treasury of the Alumni Association as a nucleus for this purpose, but no further additions have been made to the fund. Mr. England stated he would communicate with the Pacific Coast Graduates and suggest their proceeding with the work of completing the Scholarship.

Mr. England read a communication from Professor Wulling of the Department of Pharmacy, University of Minnesota, relative to the loss of their building by fire. On motion, the sympathy of the Board in the loss they had sustained, was extended to them.

A vote of thanks was tendered William E. Weiss, class of 1896, for the donation of a projecting lantern.

A vote of congratulations was extended the Philadelphia Academy of Natural Sciences on their Centenary Anniversary.

April 2nd. Fourteen members were present.

A communication from the Secretary of the College was read, announcing the names of those who have been elected to membership in the Board of Trustees at the meeting of the College held March 25, 1912. Mr. George M. Beringer was elected Chairman of the Board, Walter A. Rumsey, Vice-Chairman, and Mr. Jacob S. Beetem was re-elected Registrar.

Committee on Library reported additional accessions to the Library by purchase and gifts. Number of persons using the Library in February was 159, in March 117.

Committee on Examinations reported that Edward Francis Kenney and Charles Louis Wagner had complied with all the requirements of the College for the Certificate of Proficiency in Chemistry and were now entitled to receive the same. It was so ordered.

Committee on Announcement reported that the Special Committee had given much attention to the preparation of the Special Bulletin, and when completed it would be very helpful to applicants preparing for entrance examinations. The Special Committee considering the suggestion of a preparatory or coaching school reported that the Board of Education would willingly co-operate by making arrangements for applicants of the different institutions to attend an evening High School class and thus assist them to take the entrance examinations or to remove conditions.

The Chair announced the Standing Committees for the year.

The Chair read a communication from President Vincent and Professor Wulling, of the University of Minnesota, expressing appreciation of the vote of sympathy extended by the Board.

May 7th. Seventeen members were present.

Committee on Library reported 275 books accessioned and classified during April. Several additions by gifts and that the Library had been used during the month by 75 persons.

Committee on Instruction presented a lengthy report including the annual reports of the Faculty and the recommendations of the Committee. The various recommendations were fully discussed and several were referred to the Committee on Property, the others being adopted.

May 14th. Seventeen members were present.

Committee on Examinations reported the names of those who had complied with all the requirements of the College for the Degree of Doctor in Pharmacy, Pharmaceutical Chemist, and for the Certificate of Proficiency in Chemistry. After a ballot was taken they were declared entitled to receive the same.

The Committee also presented the list of those entitled to receive prizes and the Chair announced the names of those appointed to present the same. The Committee also referred to the Wellcome Cup which had been given to the Second Year Class several years ago, but which had never been formally presented. The Committee felt this award should be made the coming Commencement and that the rules and conditions governing the competing for the Cup by the Second Year Class should be the same as those governing the award of the President's Cup to the Third Year Class.

AMERICAN PHARMACEUTICAL ASSOCIATION.

COMMITTEE ON WEIGHTS AND MEASURES.

To the members of the American Pharmaceutical Association:—The Committee on weights and measures has we believe, usually confined its attention in an annual report to the status and use of the metric system. While there are still those who oppose the use of the Metric System we find that it is coming into more and more general use. For instance in the Aëroplane races at Belmont Park, L. I., the International Trophy Course was marked out in Kilometers. Furthermore in the machine shops nuts and bolts are being made according to Metric Measurement.

Your Chairman desired, in connection with the report presented last year to have some work done by the members of the Committee with a view of determining the accuracy of weights and measures actually employed in practice. Nothing was done by the Committee, but during the past year there has been considerable interest manifest, notably in New York, Pennsylvania and New Jersey, and some Legislation enacted tending to insure the consumer in obtaining correct weights and measures from the seller. The Bureaus of Municipal Research are devising plans for the creation of definite standards and for the appointment of responsible officials to protect the Public. I have had some correspondence with Mr. B. S. Thorp, the Philadelphia Assistant Manager for Whitall, Tatum and Company in regard to the subject of graduates used by druggists, and asked him to outline in condensed form the results of their observations on this subject to be published in connection with this report. Mr. Thorp writes as follows:

In an issue of "*Collier's Weekly*," published as near as we can recall, early in March, there appeared an illustrated article calling attention to the alarming prevalence in New York City, of the use of incorrect Weights and Measures in almost all lines of trade. The statement was made that the City of New York, through its Commissioner of Weights and Measures, had confiscated thousands of false Weights and Measures, which were in daily use in all parts of the City, and, loading them on vessels, took them to sea and threw them overboard. The statement thus made confirmed our knowledge of the situation, particularly as applying to Glass Graduate Measures offered to the Drug Trade. We had previously purchased of three Wholesale Druggists, in widely separated localities, 3 doz. 8 oz. Graduates, for the purpose of comparison with those graduated correctly according to the Government Standards. The result of our examination showed indifference to the requirements of the U. S. Bureau of Standards, and proved conclusively that quality had been sacrificed to price. The manufacturers have undoubtedly been enabled to continue marketing these inaccurate Graduates by reason of the fact that many Druggists were not aware of the character of the goods being offered them.

Not ONE of the 36 Graduates was correct. Some were better than others, but ALL were BAD.

On one, the 6 oz. mark was correct, ALL THE REMAINING GRADUATIONS WERE WRONG.

In one lot of twelve, 6 drams of liquid was required to reach the graduation marked ½ oz.

In a recent letter received by us from Lucius P. Brown, Esq., Commissioner and Chief Chemist in the Office of the Pure Food and Drug Inspection Department of the State of Tennessee, he wrote us as follows: "The findings of this inspection have led to the belief that the failure of many of the drug samples to comply with the standards may be traced to the use of inaccurate or unsuitable Weights and Measures by the Retail Druggists. We have commenced a campaign in which every effort will be made to see that this condition is corrected." It is our belief that the findings of the Tennessee Inspection will be duplicated in many other localities and Druggists will be brought to realize that their best interests are conserved by using only those utensils which are of known accuracy.

We believe that this exceedingly valuable information ought to be in the hands of the Pharmacists generally.

HENRY KRAEMER, *Chairman.*

August, 1911.

WILLIAM TRELEASE AND THE MISSOURI BOTANICAL GARDEN.

Dr. William Trelease, director of Shaw's Garden since the death of its founder, Henry Shaw, in 1889, has tendered his resignation to the Board of Trustees. Dr. Trelease gives as his reason for his action the need of more leisure for scientific research and proposes to spend the next year or two abroad. The resignation was received with regret by the board. Dr. George T. Moore has been appointed as his successor.

Dr. Trelease was selected for the directorship more than twenty-two years ago by Henry Shaw, the creator of the Missouri Botanical Garden, commonly known by his name. The famed botanist, Prof. Asa Gray of Harvard University, was responsible for bringing Dr. Trelease to the attention of Mr. Shaw. Dr. Trelease came to St. Louis from the University of Wisconsin in 1885, where he had been professor of botany. He has always been active in every movement for the betterment of St. Louis, especially in the lines of his particular interests, and Shaw's Garden has come to stand for a force in such movements.

Since 1889 the average yearly cost of maintaining the grounds and plant houses has been about $25,000, aside from improvements. The average expenditure on the library, including purchases, binding and salaries of employees, has been about $4,700, and on the herbarium about $2,700.

The inventory of Henry Shaw's estate in 1889 showed that the herbarium then contained 67,554 unmounted specimens, appraised at $3,378, and 34,660 duplicates worth $1,733. At the end of 1911 it contained 698,706 mounted specimens, appraised at $104,805, about $40,000 more than the total expenditure on it for the twenty-two years,—and a very large number of exchange duplicates.

The library was inventoried in 1889 as containing 1,077 books and an unspecified number of pamphlets, probably about 2,000, as the ratio has since run, valued at $3,050. It now contains 28,428 books, 40,375 pamphlets and 112 manuscripts, valued at $107,417, and 792,967 index cards valued at $7,929.67, which exceeds by about $15,000 the total expenditure for purchases, binding and maintenance. The increase in 1911 alone equals the total original value. The library is well balanced in all departments of botany.

The formation of a library and herbarium unexcelled in the United States in their field, by expending something less than three-fourths of their appraised value for purchases, care and attendance, has been made possible through large gifts like the Engelmann herbarium and the Sturtevant library, to which a research establishment appeals. It rests equally on the exchange value of such a scientific publication as the Garden Report, confined to the results of original investigation and at once giving to the scientific world the fruit of its activities and forming a basis of extensive exchanges,—which bring nearly 1,500 distinct publications to the library and make the institution known and its output useful in the more than 1,000 scientific libraries all over the world from which exchanges come.

The inventory of the estate in 1889 includes about 12,000 plants which are believed to have represented not over 3,000 kinds. At the end of 1911 there were cultivated 12,668 different kinds, represented by possibly 60,000 specimens. 594 new kinds were added last year and over 85,000 specimens were grown and largely used for decorative planting.

Visitors to the Garden have been counted at the gate since 1898 only, when they were believed to be considerably more numerous than prior to 1889. At the end of 1908 the number of week-day visitors was found to have doubled in the decade, largely through the establishment of a tented chrysanthemum show each fall, and apart from this to have increased about one-half, the population of the city having increased about half as rapidly.

The laboratory equipment of the establishment, acquired for the most part during the last three years and devoted exclusively to scientific investigation, is now as unsurpassed in this country for work in the diseases of plants, the physiology of soil organisms and similar subjects as the herbarium is for systematic studies, and work is being done on these subjects by an unusually able if small corps of research fellows under the guidance of an expert, Prof. George T. Moore.

H. K.

THE AMERICAN
JOURNAL OF PHARMACY

SEPTEMBER, 1912

THE MEDULLARY RAY CELLS IN RHAMNUS PURSHIANUS.*

By Henry Kraemer.

Pharmacognocists have been under the impression for some years that in the study of the medullary ray cells of more or less closely related drugs characters may be found that are useful in distinguishing between them. As a typical illustration of this point it has been stated that the medullary rays in Jamaica Quassia are from two to five cells wide while in Surinam Quassia they are one or two cells wide. As a matter of fact I have examined specimens of supposed Surinam Quassia, which were probably authentic in that they showed the absence of crystals, yet the number of cells in the width of the medullary rays closely agreed with that of Jamaica Quassia. Again, it is usual to attempt to differentiate between the barks of Rhamnus Purshianus and Rhamnus Californicus by reason of the apparent difference in the number of cells comprising the width of the medullary rays. I have been inclined to the view and have so expressed myself that the medullary ray cells in Rhamnus Purshianus are usually one or two cells wide whereas in Rhamnus Californicus they are three to five cells wide.[1] On account of the difficulty of procuring authentic specimens of Rhamnus Californicus I will not discuss at this time whether there is any actual difference in the number of cells of the medullary rays in these two barks. There is, however, considerable misapprehension on the part of different authorities in regard to the number of cells comprising the width of the medullary rays in Rhamnus Purshianus. For instance, Moeller [2] says that the medullary ray cells of Rhamnus

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* Presented at the Boston meeting of the American Pharmaceutical Association.

Purshianus are from four to five cells wide, whereas in Rhamnus Frangula they are two to three cells wide. As a matter of fact these two barks are readily distinguished in powder or in section, by the absence of stone cells in Rhamnus Frangula. Vogl[3] in his commentary on the eighth edition of the Austrian Pharmacopœia says that the medullary ray cells in Rhamnus Purshianus are from two to five cells wide, being mostly three cells wide. Karsten and Oltmann[4] in their Lehrbuch say, that the medullary ray cells in Rhamnus Purshianus are mostly three cells wide, but may occur as many as five cells in width, thus differing materially from Rhamnus Frangula. In the German Pharmacopœia it is stated that the light yellow medullary rays of Rhamnus Purshianus are usually three to five cells wide, and seldom one or two. The Pharmacopœia Helvetica states that the medullary ray cells of Rhamnus Purshianus are one to five cells wide.

The reason for these varying statements is probably due to the fact that most of the studies of crude drugs have been carried on with transverse sections. Owing to the interest in the study of powdered drugs in recent years, crude drugs are being examined in longitudinal section but generally these sections are made more or less haphazard and are probably mostly of a radial-longitudinal nature. Every student knows that in the study of cells and in the arrangement of tissues three views of them are necessary for a complete understanding of them and these are obtained by making transverse, radial-longitudinal, and tangential-longitudinal sections. Ordinarily it may not be a matter of great moment as to what kind of longitudinal sections are made, but if a clear idea of the width as well as height of the number of cells comprising the medullary rays is to be ascertained it is absolutely necessary to examine tangential-longitudinal sections, in fact sections of this character are alone necessary, particularly when made of the tissues in the vicinity of the cambium. In this view the medullary ray cells occur in more or less bi-convex groups of a limited number of cells, extending more or less scattered throughout the tissues of the collateral and bicollateral fibro-vascular bundles. It should be emphasized that these sections must be made in the area lying between the pith on the inside and the primary cortex on the outside. That is, in the bark, the sections must be made in the inner bark, because the medullary ray cells of the bark are included only in the phloem and this area does not usually extend throughout the width of the bark.

Coming to the drug which has been studied in order to illustrate this paper, it will be seen from an examination of the several sections, namely transverse, radial-longitudinal, and tangential-longitudinal, why there are these discrepancies throughout the literature in regard to the number of cells comprising the width of the medullary rays. This is especially brought out if these views are connected in a single drawing such as illustrates this paper. This illustration brings out clearly the relative position and arrangement of the tissues in the bark and one sees how in the different sections different views are presented, none of which has a meaning without the others. The following points are to be observed:

1. That the medullary ray cells occur only included within the tissues of the inner bark, that is, in those tissues inside of the primary cortex.

2. That, in the transverse section the medullary rays appear as somewhat straight or curved lines, one to four cells in width.

3. That, in tangential-longitudinal section these occur in more or less bi-convex groups. At both ends of these groups we usually find a single cell. As the convex area widens we find two cells side by side and then near the middle it may be three or four cells in width. I do not recall having seen as many as five cells side by side in the middle of these bi-convex groups. Some of the narrower bi-convex areas may not be more than two cells in width.

4. That, in comparing the tangential-longitudinal section with the transverse section, the variation in the width of the rays becomes at once intelligible.

5. That, where the rays are one cell wide in transverse section either a very narrow bi-convex group has been cut across or the section has been made across the end of a broad group.

6. That, when the ray in transverse section is three or four cells wide the section has been made through the middle of a broad bi-convex group.

7. That, in the radial-longitudinal section the medullary rays appear as a series of parallel lines, the number of cells in height depending on what part of the rays have been cut, and only if the section is made vertically through the middle of a group do we observe the maximum number of cells. The radial-longitudinal section, therefore, does not provide any additional information.

Probably sufficient has been said, in addition to the illustration here presented, to show the importance of the examination of tangential sections when studying medullary rays. This is important not only when attempting to find differences in closely related species or commercial varieties of drugs but it is absolutely necessary in describing accurately the tissue which lies between the collateral and bicollateral bundles. When studies of this kind are made as, for instance, in the rhizome of cimicifuga it is almost immediately observed that the cells between the collateral bundles are not of the type of medullary rays, and again in the study of drugs like cinnamon and cinchona where in transverse section, in some cases at least, the medullary ray cells are more or less indistinct, they are almost immediately determined when tangential sections are made.

The medullary rays are of such a definite character in that they occur in more or less bi-convex groups when seen in tangential view that only a very few tangential-longitudinal sections are necessary to bring out the number of cells which make up their width or height.

In conclusion one other observation of interest may be mentioned and that is that the medullary ray cells near the cambium have a tangential diameter usually narrower compared with those found in the region near the cortex. For instance, the width of a medullary ray cell near the cambium will be about 0.010 mm., while the width of the cell in the same ray near the cortex will be 0.020. mm.

REFERENCES TO LITERATURE.

[1] A Text-Book of Botany and Pharmacognosy, Fourth Edition, 1910, p. 524, by Henry Kraemer.

[2] J. Moeller: *Pharm. Post,* 1890 (23), p. 237.

[3] Kommentar zur achten Ausgabe der Osterreichischen Pharmakopoe, by August v. Vogl. 2te Band. 1908, p. 282.

[4] Lehrbuch der Pharmakognosie, by George Karsten and Friedrich Oltmanns. 2te Auflage, 1909, p. 133.

COMMENTS ON ETHYL-MORPHINE AND ETHYL-MORPHINE HYDROCHLORIDE (DIONIN).

By George L. Schaefer,
New York Quinine and Chemical Works (Ltd.).

Publications in pharmaceutical and chemical literature referring to these preparations differ greatly from each other in some instances, as shown in the following tables:

Ethyl-Morphine:

Beilstein Org. Chemie	melting point, 83° and 93°
Hager, Ergzbd.	“ “ 89°–90°
National Standard Dispensatory	93°
New and non-official remedies	93°

Ethyl-Morphine Hydrochloride:

	Melting Point	Solubility in Water at 15°	Solubility in Alcohol.
Beilstein, Org. Chemie	123°–125°	7 parts	1⅓ parts
Hager, Ergzbd.	119°–123°	7.4 “	1.37 “
Hager, Hauptband	123°–125°	7 “	2 “
National Standard Disp.		7 “	1 “
New and non-official remedies	125°	7 “	2 “
Schmidt, Pharm. Chemie.		7 “	1.3 “
Merck's Index		7 “	2 “

These figures are mostly incorrect and some differ so much from the real facts, that any chemist, who would have to test these preparations for their purity would have to reject a pure product as not corresponding to published statements.

I investigated five different samples of the hydrochloride. A standard quality of the alkaloid and hydrochloride was made by myself by alkylation of pure morphine. From a part of each of the five samples of the hydrochloride I obtained the free base by precipitation from a watery solution by means of ammonia water.

When morphine is ethylated the product of the reaction is not pure ethyl-morphine, but more or less of other products are formed according to the method used for alkylation and according to the conditions under which the reaction is carried out. Also some of the morphine escapes the reaction and has to be separated. The product so obtained consists of ethyl-morphine still containing some by-products from the ethylation, which are to be removed by recrystallization until the alkaloid forms distinct, white crystals, from which the pure hydrochloride can be made.

The pure alkaloid has no distinct melting point. It begins to soften at about 88° C., becoming transparent at about 90° C.–91° C., and slowly liquefies at 110° C.–115° C. If the alkaloid is not sufficiently purified it begins to soften at a lower temperature. The solubility of the pure alkaloid has been found 1:480 in water, 1:75 in ether, and 1:1,5 in alcohol at 25° C.

The hydrochloride made from the pure alkaloid also shows no distinct melting point. It softens at 110° C., gradually becoming translucent at about 120° C., and liquefying at a higher temperature, showing decomposition.

Pure hydrochloride ethyl-morphine is soluble:

At 15° C.	1:11½ in water,	1:26 in alcohol
" 25° C.	1:8 " "	1:20 " "
" 40° C.	1:4 " "	1:8.25 " "
" 50° C.	1:2½ " "	1:5 " "

Comparing the solubility of this preparation with that of the five samples bought in the market, I found, that some of these products required less of the solvents for solution. An investigation of this fact showed, that these specimens are not perfectly pure, but contained some of the by-products formed by the ethylation of the morphine and represented a mixture ethyl-morphine hydrochloride and some amorphous salt of these by-products, the latter being very soluble in water and alcohol. As there are no tests given to determine the purity of ethyl-morphine hydrochloride and nothing can be found in literature, the presence of these substances in the salt so far has been unknown. I tried to find a simple test for them, that can easily be carried out with little of the rather expensive salt. Such a test I based on the fact that a diluted solution of ethyl-morphine hydrochloride 1:40 when more than traces of these amorphous products are present, becomes milky after the addition of ammonia water, while the solution of the pure salt remains clear.

I carry out this test as follows: 2 c.c. of a solution of ethyl-morphine hydrochloride in water of 25° C. 1:40 are put in a test tube and from a small pipette three drops of 10 per cent. ammonia water added. If the salt is pure the solution remains clear and will soon separate out distinct needle-shaped crystals of ethyl-morphine. If the salt is not pure and amorphous by-products are present, the solution becomes milky and the separation of crystals may be retarded for hours, according to the amount of amorphous matter contained in the preparation.

Of the five samples of hydrochloride of ethyl-morphine two did not stand this test, while three proved to be pure.

From the salts of methyl-morphine this salt can easily be distinguished by making a solution in water 1:100, or 0.05 in 5 c.c. of water, and adding 5 drops of 10 per cent. ammonia water. If allowed to stand for about two hours ethyl-morphine will be crystallized out, while a solution of methyl-morphine remains clear, without separating crystals.

CODEINE IN COMMERCIAL MORPHINE SULPHATE.

By J. B. Williams.

During the course of an examination of some tablets of morphine and atropine sulphates, about eight months ago, the amount of alkaloid other than morphine found greatly exceeded the amount of atropine supposed to be present. This naturally led to the conclusion that either some of the morphine was extracted with the atropine, or else some other alkaloid was present. The latter proved to be the case, as is shown by the extraction of tablets of morphine sulphate containing no atropine, codeine being the other alkaloid found.

This led to the examination of a number of tablets, and samples of morphine sulphate made by leading pharmaceutical houses and manufacturers, and in every case codeine was found to be present in considerable quantities.

Samples were obtained from five large manufacturers of morphine sulphate, and tested for codeine with the following results:

Sample	Percentage Codeine Sulphate found.
No. 1	1.9 per cent.
No. 2	.9 per cent.
No. 3	3.6 per cent.
No. 4	2.2 per cent.
No. 5	7.0 per cent.

Samples of morphine sulphate tablets made by leading pharmaceutical manufacturers were also obtained and tested for codeine:

Sample		Percentage Codeine Sulphate found.
No. 1.	¼ gr	2.5 per cent.
No. 2.	⅛ gr	6.5 per cent.
No. 3.	¼ gr	3.1 per cent.
No. 4.	¼ gr	2.5 per cent.
No. 5.	¼ gr	2.9 per cent.

The method used for determining the codeine was as follows:—Dissolve 0.5–1.0 gram of morphine sulphate, or an equivalent number of tablets in a small amount of water (15–20 cc.) and add a solution of sodium or potassium hydrate until the precipitate first formed is redissolved (3–4 c.c. 5 per cent. NaOH). Shake out with three or four 20 c.c. portions of chloroform. Wash the combined chloroform extractions in another separator with 10 c.c. water made slightly alkaline with sodium or potassium hydrates. Draw off the chloroform, filtering through cotton well wet with chloroform, into a beaker or flask, and wash the separator with two 10 c.c. portions of chloroform, passing the washings through the filter into the flask. Evaporate the chloroform, dissolve the residue in excess of N/10 acid, and titrate back with N/50 alkali, using cochineal as indicator. Each c.c. of N/10 acid neutralized by the alkaloid corresponds to 0.0315 gram (0.031483 gram) of codeine alkaloid or 0.039 gram of codeine sulphate U. S. P.

That all of the codeine and practically none of the morphine is extracted by this method was proved in several cases by repeating the extraction of the aqueous residue containing the morphine. The N/50 alkali required in the titration being in every case within 0.1 c.c. of the amount required to neutralize the N/10 acid used.

The presence of 0.9 per cent. to 7 per cent. of codeine in the morphine sulphate being consumed in the United States at the present time is certainly very surprising. This condition of affairs is to be directly attributed to the lack of any test in the United States Pharmacopœia which will show the presence of several per cent. of codeine in morphine sulphate. It is a condition of affairs arising from the lack of any test which would show the purity of the product, and not from any desire to market a sophisticated product, this being evident because codeine is a more valuable product, commercially, than morphine, and is readily separated from the latter.

Manufacturers would certainly not allow the codeine to remain in their morphine sulphate at a loss to themselves, and at the expense of an inferior product.

In the manufacture of morphine sulphate the morphine is usually precipitated as the alkaloid from a large volume of water, enough to hold in solution several times the amount of codeine present. Some experiments showed that it was not possible to completely separate codeine from morphine in this way, and that part of the codeine is apparently carried down with the crystals of morphine, perhaps being isomorphous with the latter.

In order to avoid the presence of codeine in morphine sulphate in the future, the next edition of the United States Pharmacopœia should include a quantitative test for codeine in morphine. The test outlined above or some suitable modification of this test is suggested. A limit of 1 per cent. or 1.5 per cent. should also be established as the maximum amount of codeine allowable in morphine sulphate.

Analytical Dept., Parke, Davis & Co.,
Detroit, Mich., July 17, 1912.

THE VOLATILE ACIDITY OF GUM TRAGACANTH COMPARED WITH THAT OF INDIAN GUM.[1]

By W. O. Emery,
Chief, Synthetic Products Laboratory, Division of Drugs.

The primary object of this investigation was to devise additional methods for the detection of Indian gum when substituted for or in admixture with tragacanth. A study of the literature early led to the conviction that among the degradation products of these gums there must be one susceptible of quantitative isolation and sufficiency characteristic to serve as an indicator of the purity, and therefore of the quantity, of parent substance involved in its hydrolysis. Such an indicator was believed to be represented by acetic acid, already isolated from one Indian gum and reported as being present in another. The hope was entertained that tragacanth under like treatment might fail to yield this acid, but as will presently appear, experiment proved otherwise.

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[1] Circular 94 of the Bureau of Chemistry, U. S., Department of Agriculture.

As defined by the United States Pharmacopœia, tragacanth is the "gummy exudation from *Astragalus gummifer* Labillardière, or from other species of *Astragalus,* family Leguminosæ, appearing in ribbon-shaped bands varying in size and from 1 to 3 mm thick, or in irregular pieces of the same, long and linear, straight or spirally twisted; externally whitish, marked by more or less pronounced longitudinal or eccentric lines or ridges; translucent, fracture, short, tough, rendered more easily pulverizable by a heat of 50° C. (122° F.)."

While it is possible that the products known to the trade as "Indian gum" and employed so extensively in this country may vary as to their origin, it appears reasonably certain that two gums at least are justly characterized by this term, namely those of *Sterculia urens and Cochlospermum gossypium,* both of which find local application as substitutes for tragacanth. It is equally certain that none of the so-called Indian gum has its origin in any species of Astragalus. Most of the Indian gum reaching this country bears little or no resemblance to tragacanth. A careful comparison of the commodity with authentic samples obtained direct, both from London and from India, clearly indicates that it corresponds in all essential points to the gum of *Sterculia urens.* It occurs in irregular, striated, sometimes twisted, translucent, or transparent lumps, never in ribbon-shaped bands or leaves.

In view of such physical characteristics, successful adulteration or substitution of whole gum tragacanth with Indian gum is no easy matter, and yet the latter product is occasionally offered for sale in the bazaars of India as true tragacanth.[2] It is, however, the powdered form of tragacanth that presents to the sophisticator more alluring possibilities. Owing to its extended use in the arts as well as in medicine, coupled with a relatively high price for the better grades, adulteration with the cheaper Indian gum has within the past few years been of frequent occurrence, hence any method looking to the detection and estimation of such adulterant must be welcome to all desirous of obtaining pure powdered tragacanth.

CHEMICAL PROPERTIES OF GUM TRAGACANTH.

According to researches carried on by O'Sullivan[3] tragacanth consists of starch granules, cellulose—that portion insoluble in boiling water, cold dilute acids, and alkalies—likewise water-soluble gum yielding a series of gum acids of the nature of geddic acid, bassorin, bassoric acid, nitrogenous and mineral matter. As the result of an investigation of tragacanth from various sources, Hilger and Dreyfus,[4] among other conclusions, found that this product differs not only as regards chemical constitution, but also with respect to the proportion of degradation products formed when subjected to hydrolysis. None of the investigators of tragacanth, however, has, to the writer's knowledge, ever considered the possibility of acetic or other volatile acid constituting one of the hydrolytic products of this gum, due perhaps to the fact that it is odorless and without acid reaction in aqueous suspension, conditions not obtaining in the case of the two Indian gums herein considered. The remarkable property possessed by the gums of *Sterculia urens* and *Cochlospermum gossypium* of developing an acetous odor when exposed to moist air has been commented on by various authors; in fact, an examination by Robinson[5] of the hydrolytic products obtained with the gum of *Cochlospermum gossypium* developed the fact that an amount of acetic acid was formed equivalent to 14.4 per cent. of the original gum.

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[2] Zörnig, Arzneidrogen, 1909, p. 654.

[3] *J. Chem. Soc.,* Trans., 1901, *79:* 1164; Proc. 1901, p. 156.

When gum tragacanth is heated with an aqueous mineral acid, as phosphoric or sulphuric acids, and the products of such action subjected to steam distillation, an acid distillate is obtained from which acetic acid can readily be isolated in the form of its silver salt. The procedure employed is as follows:

> Treat 20 grams of whole gum first in the cold with 200 c.c. of distilled water and 10 c.c. of sirupy phosphoric acid until completely swollen, then subject for several hours to the full heat of the steam bath, whereby the mass gradually becomes partially liquefied, then distil the product with steam and evaporate the distillate to dryness in the presence of barium carbonate. Treat the residue with a little hot water, filter, and distil the filtrate, amounting to about 30 c.c., with steam after the addition of 5 c.c. of sirupy phosphoric acid.

On treating the distillate with silver oxid and filtering, characteristic plate-like needles are obtained, which on ignition prove to be silver acetate, as is evidenced by the following analytical data: 0.2048 gram of substance gave 0.1321 gram of silver; calculation for $C_2H_3O_2Ag$ gave 64.65 per cent. of silver, 64.50 per cent. being found.

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[4] *Ber. d. chem. Ges.*, 1900, *33:* 1190.

[5] *J. Chem. Soc.*, Trans., 1906, *89:* 1496.

There can, therefore, be no doubt that acetic acid constitutes one of the degradation products of tragacanth when heated with mineral acids.

ESTIMATION OF ACETIC ACID.

Quantitatively, the acetic acid or, rather, "volatile acidity"[6] is estimated as follows:

Treat 1 gram of the whole or powdered sample in a 700 c.c. round-bottomed flask, provided with a long neck, for several hours in the cold with 100 c.c. of distilled water and 5 c.c. of sirupy phosphoric acid until the gum is completely swollen. Boil gently two hours in connection with a reflux condenser, whereby a nearly clear, colorless solution is effected. A very small amount of cellulose substance will remain undissolved. Now subject the hydrolyzed product to slow distillation in a vigorous current of steam until the distillate amounts to 600 c.c. and the acid residue to about 20 c.c. This should not be driven too far, however, otherwise there may be danger of scorching the nonvolatile, organic degradation products, with consequent possible contamination of the distillate. It has been found that a spray trap if used in connection with the flask containing the hydrolyzed gum, is effective in preventing traces of phosphoric acid being carried over into the distillate. Titrate with tenth-normal potassium hydroxid in connection with 10 drops of phenolphthalein solution, finally boiling the liquid under examination until a faint pink color persists. Run a control on same amount of distillate obtained by a parallel operation, with omission of gum, but using like quantities of other ingredients and observing the same conditions as in the test.

With a relatively large number of authentic gums (Turkey, Aleppo, and Persian), both whole and powdered, the following results were obtained:

Results on 35 samples of gum tragacanth lump (cubic centimeters of tenth-normal potassium hydroxid): 3.9, 3.5, 4.2, 4.0, 3.4, 4.0, 3.2, 3.5, 4.0, 3.9, 3.4, 3.4, 3.6, 3.4, 3.5, 4.2, 4.0, 3.6, 3.3, 3.6, 3.8, 3.4, 3.3, 3.6, 3.4, 3.1, 3.3, 3.5, 3.4, 3.7, 3.4, 3.7, 3.7, 3.2, 3.4. These figures represent an average volatile acidity of 3.6 c.c. Assuming this acidity to be due solely to acetic acid, it would be equivalent to 2.15 per cent. of acetic acid in the original gum.

Results on 21 samples of gum tragacanth powdered (c.c. tenth-normal potassium hydroxid): 3.8, 3.5, 3.5, 3.5, 3.6, 4.1, 3.8, 3.4, 3.9, 3.9, 3.5, 3.7, 3.8, 3.9, 3.6, 3.8, 3.6, 3.8, 3.5, 3.6, 3.8. This gives an average volatile acidity of 3.7 c.c., equivalent to 2.20 per cent. of acetic acid in the original gum.

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[6] The term "volatile acidity" as used herein is the number of cubic centimetres of tenth-normal potassium hydroxid required to neutralize the volatile acid or acids obtained, by subjecting the products of the action of aqueous phosphoric acid on 1 gram of gum to distillation with steam.

As regards the acetic acid content of Indian gum (*Cochlospermum gossypium*) it has already been shown by Robinson[7] to yield 14.4 per cent. of this acid. That of *Sterculia urens,* however, though early recorded by Guibourt[8] as emitting an acetous odor, has never before to the writer's knowledge been examined either as to the identity or the quantity of the acetic acid present. Five grams of Indian gum (*Sterculia urens*) were therefore treated in substantially the same manner as outlined for the isolation of the silver salt from the hydrolytic products of tragacanth. It may not be amiss to note in this connection that while tragacanth yields a practically colorless solution when boiled with aqueous phosphoric acid, Indian gum, on the other hand, gives a pink or rose colored solution, a sure indication of an unknown sample that this product is present. The acid distillate obtained gave with silver oxid characteristic plate-like needles, which on ignition yielded values corresponding to silver acetate: 0.2010 gram of substance gave 0.1300 gram of silver, calculation for $C_2H_3O_2Ag$ gave 64.65 per cent., 64.67 per cent. being found.

Gram samples of whole and powdered Indian gum (*Sterculia urens*) were examined for volatile acidity, exactly as in the case of tragacanth, with the following results:

Results on 9 samples of Indian gum, lump (c.c. tenth-normal potassium hydroxid): 26.3, 26.1, 26.6, 27.7, 27.1, 28.3, 25.9, 26.1, 26.8. These data indicate an average volatile acidity of 26.7 c.c., corresponding to 15.91 per cent. of acetic acid in the original gum. The last of the nine samples, yielding 26.8 c.c., was an authentic one obtained direct from the Indian Government; this acidity corresponds to 15.97 per cent. acetic acid.

Results of 14 samples of Indian gum, powdered (c.c. tenth-normal potassium hydroxid): 26.5, 26.3, 26.1, 27.3, 26.3, 26.9, 25.4, 25.6, 27.7, 26.8, 26.6, 25.6, 27.6, 26.0. The average volatile acidity in this case is 26.5 c.c., corresponding to 15.79 per cent. of acetic acid.

CONCLUSIONS.

From the foregoing data it appears that the volatile acidity or amount of volatile acid developed by gram samples of tragacanth, on the one hand, and Indian gum (*Sterculia urens*), on the other, is fairly constant, sufficiently so, indeed, to serve, in conjunction with other well-known tests, as a very reliable criterion for estimating the purity or quantity of either alone or in admixture. The volatile acidity of Indian gum (*Sterculia urens*) as compared with that of tragacanth is nearly 7.5 times as great.

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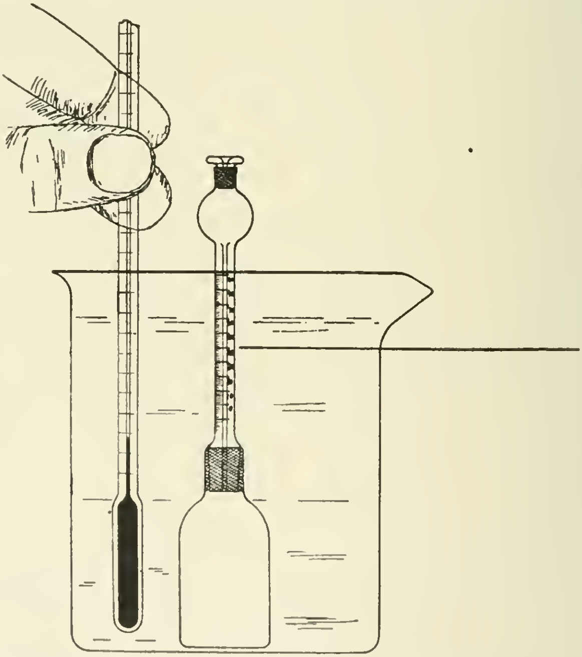
[7] *Loc. cit.*

[8] *Pharm. J.* (London), 1855, *15:* 57.

NOTE ON THE DETERMINATION OF THE SPECIFIC GRAVITY OF ETHYL ETHER, U. S. P.[1]

By George D. Rosengarten, Ph.D.

The following method for the determination of the specific gravity of ethyl ether has given satisfactory, practical laboratory results varying not more than two points in the fourth decimal place.



A calibrated pyknometer of 25 c.c. capacity, as shown in the sketch, is employed. To determine its volume the pyknometer is first weighed with water at 25 ° C., choosing a convenient mark on the stem, say 30 or 40, whichever may be more convenient, as indicated in the sketch by a line. The pyknometer is then filled with ether to a little above the mark at which the weight of water has been determined and placed in a 1000 c.c. beaker containing water which is carefully kept at 25 ° C. and constantly stirred with a thermometer. When the volume of ether becomes constant in the pyknometer the excess of ether is drawn off by means of a capillary pipette until the desired mark is exactly reached. The pyknometer is then quickly dried with soft flannel or filter paper and weighed. A capillary pipette for this purpose is easily made by drawing out an ordinary eye-dropper.

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[1] [Reprinted from the Journal of Industrial and Engineering Chemistry. Vol. 3. No. 11. November, 1911.]

LABORATORY OF THE POWERS-WEIGHTMAN-
ROSENGARTEN CO., September, 1911.

LIQUOR SODII PHOSPHATUS COMPOSITUS U.S.P.

BY MITCHELL BERNSTEIN, P.D.

Relative to this pharmacopœal preparation many formulas and suggestions have been offered. The writer conducted a series of experiments using both the U.S.P. and many suggested modifications and formulas. In this connection, each formula in turn was wanting in some respect or other.

In view of preventing the crystallization of Sodium Phosphate, it was thought that Anhydrous Sodium Phosphate might solve the difficulty. Various samples of so labelled Dried, Exsiccated and Anhydrous Sodium Phosphate were obtained from reputable wholesale houses. When examined, however, each respective sample showed a deficiency of Sodium Phosphate. Thus in one case was found 40.5 per cent. water. In another case 17.5 per cent. water of crystallization.

It is evident that if these salts were used in making the solution, after we had calculated on an Anhydrous salt, that we surely would have a brilliant preparation, but one in which we would not have the corresponding amount of uneffloresced Sodium Phosphate.

A perfectly Anhydrous Sodium Phosphate was made by the writer, according to the U.S.P. This was ascertained with surety. The Method of preparing the compound solution of Sodium Phosphate was as follows:

Dissolve the Sodium Nitrate and Exsiccated Sodium Phosphate together with the Citric Acid in a flask by means of heat of a water bath. Then make volume up to 1000 c.c. Filter while warm into a sterile container.

The use of the Exsiccated Sodium Salt appears very satisfactory, for in the many preparations made using the Exsiccated Salts no crystallization has ever occurred.

Several preparations have been kept under observation for a little over three years to date, having used the 4 per cent. Sodium Nitrate and 13 per cent. Citric Acid in the preparation as per U.S.P. together with the proportional amount of Sodium Phosphate exsiccated, corresponding to 1000 Gms. Sodium Phosphate. During the three years the preparations have been exposed to varying temperatures, varying from 30° F. to 95° F. The preparations still remain clear, colorless and sparkling; never having even shown signs of crystallization at as low as 30° F. and still free from any fungous growth, which is always manifest after the U.S.P. preparation remains standing for some time.

In conclusion the writer would suggest the use of

		Grams.
Sodium Nitrate	4%	40
Citric Acid	13%	130
Anhydrous Sodium Phosphate		396.6
(equivalent to 1000 Gm. Sodium Phosphate)		
Distilled Water to make		1000 c.c.

Add the Citric Acid and Sodium Nitrate to 150 c.c. of Distilled Water contained in a flask, then add the Anhydrous Sodium Phosphate. Dissolve by the aid of heat of water bath. Make volume up to 1000 c.c. and filter while warm into a sterilized container—stoppered with a sterile plug of absorbent cotton.

When made as above, we obtain a preparation, which, as has been stated, is clear, colorless, sparkling and permanent and representing the U.S.P. amount of Sodium Phosphate in this preparation.

PHYSIOLOGICAL EFFECTS OF CARBON MONOXIDE.[1]

By Henry S. Munroe.[2]

An interesting pamphlet on carbon monoxide has recently been issued by the Bureau of Mines, in which attention is drawn to the dangerous properties of this gas and to the use of mice and birds for detecting its presence in mine air. The author quotes largely from various publications of Dr. J. S. Haldane of Oxford University, who for many years has made special study of the subject of mining hygiene and the dangerous gases met in mines. On page 6 the author states: "According to Haldane, carbon monoxide has no other effect than that resulting from its interference with the oxygen supplied to the tissues, and apart from its property of combining with the hæmoglobin it is physiologically indifferent, like nitrogen." The author also outlines an experiment in which he remained for twenty minutes in an atmosphere containing 0.25 per cent. of carbon monoxide, "at the end of which time he suffered only a slight headache, although later he became ill. The illness lasted for several hours and was accompanied by nausea and headache." The quotation from Haldane, and this experiment, are likely to give a false impression as to the dangerous properties of this gas; it has therefore seemed wise to give a few facts to the readers of the *Quarterly,* that others may not be led to repeat the experiment made by the author of the pamphlet, and to give some idea of the dangerous nature of this gas even when present in very small percentage.

Carbon monoxide is a product of incomplete combustion. It is present in large quantities in producer gas and water-gas, and in dangerous amounts in the gases from boilers and furnaces of all kinds. It is often present in large proportions, and always in dangerous amounts, in powder smoke, in the gases from underground as well as surface fires, and in the after-damp from explosions of firedamp and coal dust.

Carbon monoxide has the property of forming a compound with the hæmoglobin of the blood. The effect of this is to make the hæmoglobin, so combined, practically inert and to prevent it from acting as a carrier of oxygen. When so much carbon monoxide is absorbed that the greater part of the hæmoglobin is inert, death results. The affinity of carbon monoxide for hæmoglobin is over two hundred times greater than that of oxygen, so that when present in the air, even in small quantities, it is freely absorbed by the blood. Carbon monoxide is not displaced by oxygen but is dissociated by natural processes, and escapes in the expired air. Where large quantities are absorbed, it may be several days before the last traces disappear. According to Drs. Edsall, v. Jaksch, Haldane, and other authorities, 0.05 per cent. of carbon monoxide is dangerous. According to Haldane, severe symptoms were observed from breathing air containing 0.02 per cent., or one part in five thousand. With this small amount present the blood becomes 20 per cent. saturated after about 20 hours, producing slight giddiness and shortness of breath. At this point an equilibrium seems to be established, and the dissociation of the gas keeps pace with its absorption. With increasing percentages of carbon monoxide the saturation of the blood becomes greater and the time required to produce the maximum effect shorter. With 0.08 per cent. present, the blood becomes 50-per cent. saturated within a few hours; it becomes scarcely possible to stand and even slight exertion results in loss of consciousness, the senses are confused and the judgment is impaired. Sometimes the victim either becomes stupid and drowsy, or much excitement results, not unlike the effects of alcohol. Another experiment by Dr. Haldane proved that with 0.20 per cent. CO in the air, the blood becomes 50-per cent. saturated in 70 minutes. With 0.25 per cent., the amount present in the Bureau of Mines experiment, this dangerous condition would be reached in less than one hour.

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[1] Reprinted from *School of Mines Quarterly*, July, 1912, pp. 340-344.

[2] Professor of Mining, Columbia University, New York.

According to v. Jaksch, the absorption of 0.8 gram of carbon monoxide is fatal. According to Haldane, if death occurs gradually the hæmoglobin is usually about 80-per cent. saturated with carbon monoxide. Post-mortem examinations of persons who have died from carbon monoxide poisoning show that the effect is to produce intense congestion of the vital organs, especially in the brain, usually accompanied by small hemorrhages. It is possible that this congestion is due to the attempt of nature to make good the diminished efficiency of the blood by supplying larger volumes at needed points.

Even when death does not occur, very serious results are likely to follow from the absorption of this gas by the blood. The after effects are lesions, cysts and local softening of the brain tissue,[3] inflammation of the membranes of the stomach and intestines, pneumonia, bronchitis, pleural effusions, inflammation of the kidneys, fatty changes in the heart, anæmia, splenic enlargement and other derangements of vital organs, sometimes resulting in death even after several years. It is believed that Sir Clement LeNeve Foster was a victim to carbon monoxide poisoning which occurred on a visit as chief inspector of mines to a mine in Cornwall some years before his death. From the very full record given by Mr. Foster of his symptoms while exposed to the gas underground it does not appear that there could have been more than 0.08 per cent. of carbon monoxide present, nor that his blood could have been more than 50-per cent. saturated, although direct evidence on both these points is lacking. The experiment made by the author of the paper recently issued by the Bureau of Mines, in which he exposed himself for twenty minutes to an atmosphere containing five times as much carbon monoxide as is known to be dangerous, was therefore hazardous and even though the experimenter apparently suffered but little ill effect a somewhat longer exposure would certainly have resulted in serious injuries, the after effects of which might have proved fatal.

One of the most serious dangers from the presence of carbon monoxide in the air of mines is the effect upon the health of workmen who are daily exposed to the breathing of small amounts of this gas. The blood, when partly saturated, is thereby rendered less able to perform its proper functions, so that the patient suffers from anæmia and all the complications that may result from this weakened condition. According to Dr. Edsall, the disease known as miners' phthisis has been shown to be due chiefly to carbon monoxide poisoning. Recent observations have shown that for some hours after a blast, under ordinary mining conditions, carbon monoxide may be present in the air in dangerous amounts, and undoubtedly men engaged in sinking, drifting, and stoping where the circulation of air is deficient have their blood partially saturated with carbon monoxide the greater part of the time.

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[3] In a personal letter, Professor Walter B. James, of the College of Physicians and Surgeons, states that a peculiar local lesion of the brain, with softening of the lenticular nucleus is fairly characteristic of carbon monoxide poisoning. The action of the gas upon this area has not been satisfactorily explained. It has been suggested that it is due to the peculiar angle at which minor blood vessels are given off to this area from the arterial trunks.

According to Dr. James, the remote consequences of monoxide poisoning are a serious matter. His cases have shown mental aberration of a peculiar type, with great slowness to response, going on to cerebral degeneration and death.

By some authorities it is believed that the serious effects above outlined, due to absorption of carbon monoxide by the blood, are supplemented by direct toxic action on the nervous system, on the muscles, the heart and other organs. It is believed by others that there is a cumulative action and that those who have been poisoned by this gas are more likely to become victims when again exposed to it. It is quite certain that dissociation of carbon monoxide from the blood is slow and that those whose blood is partly saturated will sooner fall victims where larger quantities of the gas are breathed than those whose blood is free from this gas. Men who have repeatedly suffered from carbon monoxide poisoning become very sensitive to the gas, and in most instances are compelled to abandon work in which they are compelled to breathe air containing it.

The symptoms by which carbon monoxide poisoning may be detected are not difficult of recognition. The blood becomes a brilliant cherry red, and in serious cases red or bluish-red spots appear on the front of the neck, on the trunk, thighs and elsewhere, lasting for some days, and in fatal cases apparent after death. The mental disturbances, weakness and lassitude, have been noted. This is followed by headache, accompanied by nausea, often lasting 24 or 48 hours, even in slight cases. In more serious cases, the headache may recur at intervals for some months. Loss of consciousness with convulsions, may occur several hours after the poisoning. One of the first symptoms is weakness in the knees and legs, sometimes lasting for days, with aching from the knees to the ankles. Local pains in the region of the heart, and palpitation of the heart, are common and may recur at intervals for a month or more. Foster, and several others, have published valuable notes on these symptoms, which will be found in the appendix of Foster and Haldane's Investigation of Mine Air.

REFERENCES.

Burrell, George A.: The Use of Mice and Birds for Detecting Carbon Monoxide after Mine Fires and Explosions. Technical Paper 11, Bureau of Mines, Washington, 1912.

Foster, C. & Haldane, J. S.: The Investigation of Mine Air.

Edsall, D. L.: Osler's Modern Medicine, Chap. VIII, p. 141.

v. Jaksch, R.: Die Vergiftungen, Nothnagel Specielle Pathologie u. Therapie, Vol. 1, p. 257.

THE CLASSIFICATION OF CARBON COMPOUNDS.[1]

By Marston Taylor Bogert.

The system of classification adopted for a science at any given period registers quite accurately the state of the science at that period, and the changes in the classification therefore record its progress. It is, hence, practically impossible to give any intelligible description of the various methods of classification which have been employed for carbon compounds without at the same time sketching briefly the changing conceptions and theories of which they were to so large an extent the natural reflection, for without such a setting the picture would have no proper background or perspective.

The classifications which are considered are particularly those which have been used for textbook instruction in organic chemistry, and no place is given to those which have been devised solely for the patent offices, for reference, or for other special purposes.

Man being naturally of an inquiring mind, he has probably speculated upon the composition of this world of ours ever since he first appeared upon it, for in the oldest records we find theories concerning the elements of which it is composed.

The doctrine of the four so-called "elements"—earth, air, fire and water—was first enunciated in Greece by Empedocles, about 440 B. C., but generally bears the name of Aristotle. Neither Empedocles nor Aristotle regarded these elements as different forms of matter, but rather as different properties or manifestations of one original matter. Aristotle also added a fifth element, ὐοσία, to which he ascribed an ethereal or immaterial character and which he assumed permeated the universe. As the oldest writings of India contain a similar theory of four elementary principles and an ethereal substance, it is possible that both Aristotle and Empedocles were familiar with this fact and were only introducing into Greece this ancient Indian theory.

The oldest nations were familiar with the metals and refer to them frequently in their writings, but it should not be forgotten that some of the earliest chemical facts on record have to do with carbon compounds. The only acid known to the ancients was acetic (as vinegar), so that the name of this substance and the idea of acidity were expressed by closely related words; in the Greek, ὄξος for vinegar, and ὀξύς for acid; in the Latin, acetus and acidus. The first reagent of any kind mentioned was the extract of gall nuts, which Pliny says the ancients used to detect the presence of green vitriol in verdigris. The first salts artificially prepared were those obtained by the action of vinegar upon alkalies. The first crude attempts at distillation were with turpentine. The ancients were familiar also with fats, resins, organic coloring matters (like indigo and Tyrian purple), sugar, gums, the preparation of wine from grape juice, of beer from malted grain, of mead from honey, of soap from fats, and many other facts in these and related fields. Organic chemistry, therefore, does not give place in point of age to inorganic. Largely due to the influence of Alchemy, however, the object of which was the transmutation of baser metals into silver and gold, the mineral side of the subject was the first to be extensively developed.

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[1] Reprinted from *Proc. Amer. Philos. Soc.*, July, 1912, pp. 252–268.

According to the pseudo-Geber, all metals consisted of sulphur and mercury, in varying amounts and in different degrees of purity. The old Aristotelian "elements" he appears to have regarded as subsidiary constituents, or perhaps as the ultimate components of the sulfur and mercury. To the pseudo-Geber's two elements, Basil Valentine added a third, "salt," not meaning any particular compound but the properties characteristic of common sodium chloride, and he assumed these three to be the elementary constituents not only of metallic substances but of organic as well; sulphur endowing the substance with combustibility, or the property of changing in the fire, and also explaining color changes, mercury giving metallic properties and volatility, and salt representing the principle of solidification and of resistance to fire.

In spite of the great amount of experimental work carried out by the alchemists, and the large number of new facts discovered by them, their writings were so obscured by mysticism, exaggeration and deceit, that little real progress was made toward a more accurate understanding of the nature of chemical compounds which might be utilized in constructing a more satisfactory method of classification. No attempts were made to determine the actual constituents of compounds, for it was assumed that in the formation of a compound the original substances were annihilated and an entirely new substance created. Hence the only classification in vogue was a rough grouping of substances according to their physical properties, or apparent outward resemblance, and many of our common names are reminders of this bygone empirical method. Thus, olive oil and other vegetable and animal oils were grouped with oil of vitriol and oleum tartari (deliquesced potassium carbonate); spirit of wine (alcohol) with fuming spirit of Libavius (stannic chloride), spirit of hartshorn (ammonium hydroxide solution) and spirit of nitre (nitric acid); butter with butter of antimony (antimony trichloride) and other semi-solid metallic chlorides. Colorless solids, soluble in water and of characteristic well marked taste, were all classed as "salts," and this group thus included sugar.

The goal toward which the alchemists strove was the philosopher's stone, the grand elixir or the magisterium, as it was variously called, whose virtues were such that it could not only transmute baser metals into silver and gold, but could also prolong life indefinitely. As the claims concerning the transmutation of metals were increasingly discredited and the trickery and deception of the alchemists exposed, more investigators directed their attention toward the second great function of the philosopher's stone, the prolongation of life, and many compounds were discovered of considerable therapeutic value. Great interest was aroused by these investigations, and Paracelsus finally announced that "the object of chemistry is not to make gold but to prepare medicines." Thus, in the first half of the sixteenth century, chemistry began to develop in a new direction, at first not far removed from alchemy, but gradually diverging from it more and more widely, and approaching closer and closer to medicine, until the coalescence of the two sciences appeared practically complete. And thus arose the period of iatro chemistry, when chemistry, which had long been looked upon as a valuable helpmeet to medicine, came to be regarded as the basis of the entire medical art.

Although in this period the chief development was again along the mineral side, probably because of the relatively greater simplicity and stability of these preparations, still no little organic investigation was conducted and a number of new compounds were added to the science. Little progress was made in gaining a truer insight into the character of chemical compounds, and hence no important changes in classification appear. Paracelsus himself, the founder of the iatro-chemical school, adopted Basil Valentine's three elements (sulphur, mercury and salt) as the basis of his doctrines.

By the middle of the seventeenth century, chemistry awakened to the fact that it had a destiny of its own to realize, struggled to its feet and, refusing longer to be supported by other sciences, started forward, to be sure rather unsteadily and uncertainly at first, but with the firm determination to do something for itself.

The history of chemistry proper begins with Robert Boyle about 1660, who taught that its main object was the determination of the composition of matter. Through his labors, and those of Rouelle and others, the terms "element" and "chemical compound" were more fully explained and appreciated; nevertheless many of their colleagues still adhered to the old alchemical or even the Aristotelian elements. Kopp, in his "Geschichte der Chemie," gives an excellent picture of the epoch-marking effect of Boyle's ideas:

> "What a contrast is exhibited between the ancient idea of the cause of difference in various forms of matter and that which obtained at the time of Boyle! If we consider these two opposite conceptions historically, and the transition from the one to the other, they appear like two totally dissimilar pictures; but, like dissolving views, changing the one into the other by slow degrees. In the first place we have the Aristotelian idea, according to which, matter itself devoid of properties, becomes endowed with characteristic qualities by the addition of properties, and forms, when invested with these properties, the various substances known in nature; then this idea passes gradually into that of the alchemists, but becomes confused in the transition, inasmuch as the differences of physical condition and properties are no longer regarded as the only causes of varieties in substances; the difference in chemical properties receives more attention, the existence of elements, the producers of such properties is assumed; and thus the path is prepared which leads to the idea of chemical composition. Then we see the Aristotelian theory gradually becoming indistinct, whilst the idea of the importance of the chemical deportment and composition of bodies assumes prominence, and at last we see clearly that the differences between the substances which nature presents to us in such overpowering numbers, or which we have ourselves formed artificially, depend upon differences in their chemical composition. The idea of chemical composition, which makes its first appearance indistinctly in the history of the chemistry of the Middle Ages, now forms the foundation of the science."

The most important and interesting problem at this time, and the one upon which most attention was focussed, was the chemistry of combustion. Attempts to explain the phenomena of combustion finally led to the phlogiston theory of Stahl, which dominated the science from the end of the seventeenth through the eighteenth century.

In 1675, Nicolas Léméry published his "Cours de Chimie," which soon became one of the most popular textbooks of the time and passed through thirteen editions during its author's lifetime. In it he divided all natural substances into mineral, vegetable, and animal; including in the second group plants, resins, gums, fungi, fruits, acids, juices, flowers, mosses, manna and honey; and under the third heading describing the various parts of animal bodies. This classification was quite generally adopted, and thus arose a distinct separation of mineral chemistry from the chemistry of substances occurring in plants and animals. The phlogistonists had previously opposed any such subdivision, contending that the differences observed depended upon a variation in the composition of the bodies classed under the three heads. So Becher, in 1669, argued that the same elements occur in the three natural kingdoms, but that they are combined in a simpler manner in mineral substances than in vegetable or animal. Stahl, in 1702, asserted that in vegetable as well as in animal substances the watery and combustible principles predominated, and that these ultimate constituents made their appearance when the organic compound was heated out of contact with air, water and combustible charcoal being formed. These ideas were successfully combated by Boyle, who had shown, as early as 1661, in his "Sceptical Chymist," that the application of heat leads to quite different results depending upon whether air is present or not, and that the various residues thus obtained are unlike.

Many organic substances were discovered during this phlogiston period, but their real composition (even qualitative) remained unrecognized. For example, it was assumed that the ultimate constituents of alcohol were oil and water, or a combustible and a mercurial principle. By far the greater number of the investigations recorded were still in the inorganic field, probably for reasons already given, and also because it had not as yet been possible to prepare organic compounds synthetically. While, as has been said, many authors adopted Léméry's method of separating mineral, vegetable and animal substances, others still adhered to the old system of grouping together all acids (sulphuric with lactic, tartaric, etc.), all salts, etc.

Boyle's influence was soon effective in directing a closer scrutiny of the composition of compounds, and gradually the true elements were isolated and studied.

The discovery of the composition of carbonic acid gas by Lavoisier in 1775, and that of water by Cavendish, showed the presence of carbon and hydrogen in alcohol (1748). Lavoisier, having established the true principle upon which combustion depends, analyzed various organic substances and came to the conclusion that vegetable substances were composed generally of carbon, hydrogen and oxygen, while animal substances contained also nitrogen and occasionally phosphorus. He did not distinguish organic chemistry as a special branch of the science, or define it as "the chemistry of the compound radicals." He discussed all acids together, subdividing them into mineral, vegetable and animal.

Macquer, who was professor of medicine in the University of Paris, and a contemporary of Lavoisier, in his "Elements of the Theory and Practice of Chemistry" (English translation of 1775) discusses mineral, vegetable and animal oils together, and in the separate sections of his work devoted to vegetable and animal chemistry divides the subject according to the method of treatment employed to obtain the substance rather than according to the character of the substance itself. Thus we have as the main headings, "Operations on unfermented vegetables," "Operations on fermented vegetable substances," and "Operations on animal substances."

Fourcroy (about 1790), however, in his well-known text-book, makes a clean-cut division, placing the vegetable acids in the section dealing with the vegetable kingdom, and the animal products all under the animal kingdom.

It should be noted that at this time carbon was supposed to exist as such in plants and animals. So Chaptal, in 1791, says:

> "Carbon exists ready formed in vegetables. It may be cleared of all the volatile and oily principles by distillation, and, by subsequent washing in pure water, it may be deprived of all the salts which are mixed and confounded with it."

In Thomson's "System of Chemistry" (third edition, 1807), marsh gas and olefiant gas are discussed with the element carbon, but the other carbon compounds are scattered under various headings where they are mixed in with inorganic substances.

In the text-books and treatises on chemistry at this period it was customary to combine mineralogy and geology with the mineral part, botany with the vegetable section, and physiology with the portion dealing with animal chemistry, while occasionally physics received as much space as chemistry in the introductory chapters.

The ætherin theory of Dumas and Boullay, propounded by them in 1815, and later adopted by Berzelius, was an adaptation of the early theories concerning the composition of organic compounds (by which they were supposed to consist of an aqueous and a combustile principle) to new conditions. In their theory, many derivatives of alcohol were regarded as compounds of C_2H_4 (to which Berzelius had given the name "ætherin"), in the same way that ammonium salts are derived from NH_3:

$$\begin{gathered} C_2H_4.HCl = NH_3.HCl, \\ C_2H_4.H_2O(\text{alcohol}) = NH_3.H_2O, \\ C_2H_4.H_2SO_4 = NH_3.H_2SO_4, \\ (C_2H_4)_2H_2O(\text{ether}) = (NH_3)_2H_2O(?). \end{gathered}$$

The attempt was made to apply this system of classification to other derivatives of alcohol and even to extend it to all organic compounds; but it never won any widespread recognition.

Berzelius, in 1817, explained the difference between inorganic and organic compounds by stating that every oxidized inorganic compound contained a simple radical, while organic compounds consisted of oxides of compound radicals; and that in vegetable substances the radical usually consisted of carbon and hydrogen, while in animal substances it consisted of carbon, hydrogen and nitrogen. He therefore defined organic chemistry as "the chemistry of the compound radicals" (1843). His conception of the structure of organic compounds was a dualistic electro-chemical one, in which the organic radicals played the same rôle as the elements in inorganic compounds; thus, both electro-positive and electro-negative radicals were assumed.

Gmelin, in the first edition of his great "Handbook" (1817), says that a clear distinction should be made between inorganic and organic chemistry, but that this is a distinction which can be more readily felt than strictly defined. He describes inorganic compounds as binary compounds, the simplest consisting of compounds of two elements, a basic oxide or an acid oxide, which can again unite to form a binary compound of a higher order, *i.e.*, a salt. Organic substances, on the other hand, are at least ternary compounds, or are composed of three simple substances, generally united in less simple ratio than in inorganic. Hence, he includes in the inorganic portion of his book methane, ethylene, cyanogen, and the like. He adds, further, that organic compounds cannot, like the inorganic, be artificially built up from their elements.

Berzelius also supported the last statement, claiming that in living structures the elements obeyed totally different laws from those which regulate their behavior in the inanimate world. Organic bodies were thus regarded as the special products of a mysterious vital force and, although he admitted that bodies occurring in nature might be converted into other organic compounds by chemical reactions, he maintained that none could ever be built up from their elements. Consequently, Wöhler's production of urea from ammonium cyanate in 1827, being an incomplete synthesis, did not immediately overthrow the vitalistic doctrine. Then too, this synthesis remained for some time the only case of the kind, and urea itself was regarded as standing halfway between inorganic and organic compounds, because of the ease with which it decomposed into carbon dioxide and ammonia.

As the result of the classic researches of Liebig and Wöhler, in 1832, upon the radical of benzoic acid, the radical theory was enlarged by both Berzelius and Liebig.

Dumas, in 1837, explained the origin of so large a number of organic compounds from so small a number of elements, by stating that the latter unite to various radicals, which occasionally act as chlorine or oxygen, and occasionally as a metal. Cyanogen, ethyl, benzoyl, etc., were therefore said to constitute the elementary bodies or organic chemistry, their elementary components only being recognized when the organic nature of the compound was entirely destroyed. It is easy to see therefore why the search for these organic radicals was vested with such interest. In fact, the discovery and isolation of these radicals became the most interesting problem of the day and led to many valuable results.

In the text-books of this date, we find practically all organic compounds grouped under the two headings of Vegetable and Animal Chemistry; very few organic substances remained in the Inorganic part. An ever increasing number of these compounds found place in the separate chapters on Carbon and its Derivatives. Thus, in the manual compiled by Webster in 1826, when lecturer in chemistry at Harvard University, we find, in addition to CO, CO_2, and other simple compounds previously discussed with carbon, also the chlorides of carbon, cyanogen, cyanogen halides, HCN, thiocyanic acid, CS_2 and thiocarbonates; in Dumas' great "Traité de Chemie" (1828) also rose oil, naphthalene, sweet oil of wine, naphtha, petroleum, turpentine, cyanic and fulminic acids. In most cases, the acids, being most important, were the first to be considered under the heading Vegetable Chemistry, then followed the other groups—oils (fatty and volatile), carbohydrates, camphors, alkaloids, etc., the rapid increase in the knowledge of organic compounds being exhibited in the closer and more logical classification within the groups. The term "organic chemistry," to include both vegetable and animal chemistry, used by Berzelius in his "Handbook," was quite generally adopted.

(*To be continued.*)

PROGRESS IN PHARMACY

A QUARTERLY REVIEW OF SOME OF THE MORE INTERESTING LITERATURE RELATING TO PHARMACY AND MATERIA MEDICA.

By M. I. Wilbert, Washington, D. C.

Legislation both State and National is attracting the attention of pharmacists in all sections of the country and the annual meetings of many of the State Pharmaceutical Associations were largely devoted to the discussion of matters of legislative interest.

The annual Conventions of the National Association of Retail Druggists and of the American Pharmaceutical Association will be history before this copy of the Journal reaches its readers. From present indications these meetings will be more than usually attractive to pharmacists and they will, no doubt, be well attended.

The British Pharmaceutical Conference held its annual meeting this year at Edinburgh, July 29 to August 1, inclusive. The program was more than ordinarily interesting, and included a number of unusually valuable contributions to pharmaceutical literature.

The list of papers includes: Suggestions for the more extended cultivation of drugs, by J. H. Evans; The preparation of bacterial vaccines, by Ian Struthers; Activity of digitalis leaves, and stability and standardization of tinctures, by Gordon Sharp and F. W. Branson; The measurement of relative tryptic activity, by A. R. Smith; The iodine content of thyroid gland, by N. H. Martin; The determination of nitrates in bismuth carbonate, by Walter Ryley Pratt; Note on calcium lactate, by C. A. Hill and A. T. Cocking; Notes on commercial formates, by Thomas Tyrer and F, C. Gosling.

The meeting next year, the fiftieth, will be in the nature of a jubilee and will be held in London.

The Eighth International Congress of Applied Chemistry, to be held in Washington and New York, September 4 to 13, promises to be an unusually interesting affair. A very elaborate program of social events has been prepared, and the scientific program promises to be equally interesting. The opening meeting is to be held in Washington, D. C., September 4, 1912, and other business and scientific meetings are to be held in New York, beginning Friday, September 6, 1912, and ending Friday, September 13, 1912. In addition to the meeting of the International Congress, the American Chemical Society, the Society of Chemical Industry and the Verein Deutscher Chemiker will hold business and scientific meetings in New York, the Society of Chemical Industry will hold its annual meeting at the Chemists' Club on September 3, while the Verein Deutscher Chemiker will hold its annual meeting at Havemeyer Hall, Columbia University, on September 2.

Pharmaceutical Education.—The College of Pharmacy of the city of New York as a department of Columbia University, has taken a marked step in advance in the matter of pharmaceutical education. In addition to the degree of Graduate in Pharmacy which will be as heretofore, given to students entering the college on a basis of 15 "Regents Points," the college will in the future institute a course requiring 72 "Regents Points" for entrance, leading up to the degree of Pharmaceutical Chemist at the end of 2 years, Bachelor of Science in Pharmacy at the end of 4 years, and Doctor of Science in Pharmacy at the end of 6 years.—*D. A. Apoth. Ztg.*, 1912, 33, pp. 62–3.

Revision of the Pharmacopœia.—Prof. Joseph P. Remington, the chairman of the Committee of Revision, in a comprehensive report on the progress that is being made, points out that up to the time that his report was compiled no less than 4,592 pages of official communications had been sent out to the members of the

Revision Committee.—*American Druggist,* 1912, v. 60, pp. 275–6.

The Physician and Drug. Standards.—An editorial (*J. Am. M. Ass.,* 1912, v. 59, p. 291) comments on the history of the Pharmacopœia and points out that physicians who are interested in the progress of medicine have always contended that the Pharmacopœia should contain only good drugs that are of practical value to the physician. This idea has grown and a long list of useless drugs was submitted to the United States Pharmacopœial Convention for elimination from the Pharmacopœia. Just how far it will go in the elimination of these drugs is not known, but present appearances indicate that the wishes of the physicians in the matter will be practically ignored.

Extra Pharmacopœia.—An editorial (*Chem. & Drug.,* 1912, v. 81, p. 50) calls attention to the fifteenth edition of Martindale and Westcott's Extra Pharmacopœia, which has been issued in two volumes at 14s. and 7s. respectively.

Hygienic Laboratory Bulletin No. 84, comprising a "Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary for the Calendar Year Ending December 31, 1910," has been distributed. Additional copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., who sells the publication at cost.

Pharmaceutical Literature.—An unsigned article (*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 247) calls attention to the compilation of titles of pharmaceutical journals published by the International Union at the Hague and reprints the list entire.

New Remedies.—The methods for controlling the marketing of new remedies that have been followed by the Council on Pharmacy and Chemistry of the American Medical Association have been adopted by a somewhat similar committee of the German Congress for Internal Medicine under the active leadership of W. Heubner, editor of the *Therapeutische Monatschefte.*

This committee (*Therap. Monatsh.,* 1912, 26, p. 309–17) publishes the rules that have been adopted as the basis for its endorsement or non-endorsement of remedies and presents three lists of remedies that have been acted on so far: (1) a positive list consisting of articles not objectionable; (2) a negative list consisting of articles of fraudulent or objectionable character, and (3) a doubtful list consisting of articles whose value has as yet not been determined.

While the rules that have been adopted by the German Council are in some particulars different from those adopted by the Council on Pharmacy and Chemistry of the American Medical Association, and while a few of the preparations endorsed by the German Council have not been so endorsed by its American Counterpart, the object in view by both bodies is similar and the ultimate result will no doubt be of value to medicine and pharmacy generally.

Patent Medicines.—The hearings held by a Select Committee on Patent Medicines appointed by the House of Commons to inquire into the sale of patent and proprietary medicines and medical preparations and appliances, and advertisements relating thereto are reproduced at length in the current British drug journals. This investigation promises to elicit considerable information relating to the manufacture and sale of so-called patent medicines, and the information thus gained is not generally considered to be creditable to the practice of pharmacy of to-day.

Weights and Measures.—The Ministry of the Kingdom of Württemberg has adopted official abbreviations for metric weights and measures, of which the following are characteristic:

Meter	m
Decimeter	dm
Millimeter	mm
Liter	l
Milliliter	ml
Kilogram	kg
Gram	g
Milligram	mg

The abbreviations are lower-case, without periods, and are to appear at the end of the figures, following the decimal point.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 437.

International Standards.—A news note (*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 253) reports the formation of the international association of chemical societies which took place in Berlin, April 11 to 13, 1912.

International Pharmaceutical Congress.—An unsigned article (*Südd. Apoth.-Ztg.*, v. 52, p. 317) announces that the next International Pharmaceutical Congress will be held at the Hague in September, 1913, and will be presided over by Dr. L. van Ittalie, Professor of Pharmacy at Leyden. The Congress is to be divided into five sections to discuss general questions, galenical preparations, chemistry, bromatology, and botany.

Acetylcresotinic Acid.—This preparation, also known as Ervasin, is said to be similar in its therapeutic action to aspirin, and is being used as an anti-rheumatic.—*Therap. Monatsh.*, 1912, v. 26, p. 495.

Agar Agar.—Gehe & Co. report that the chief market for agar agar is to be found in Germany, and that the substance is derived from different species of algæ, of which *Gelidium corneum* is perhaps the most important. At the present time agar agar is being used quite extensively as a vehicle for active medicaments, more particularly cascara, rhubarb, gambir, and ipecac.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 231.

Alcohol.—Beyer (*Ztschr. f. Hygiene u. Infektionskrankheiten*, v. 70, p. 225) reports additional experiments to show that 70 per cent. alcohol is materially more efficient as a disinfectant or germicide than all other concentrations of alcohol. He found it to be thirty times as powerful as 60 per cent. and more than forty times as powerful as 80 per cent. alcohol. Concentrations under 60 per per cent. and over 80 per cent. were found to be practically valueless as disinfectants.—*Pharm. Zentralh.*, 1912, v. 53, p. 723.

Antiseptics.—An unsigned article (*Südd. Apoth.-Ztg.*, 1912, v 52, pp. 367–8) calls attention to the book by Rudolf Geinitz, in which the latter reports a comparative study of the narcotic and disinfecting action of several volatile oils and their active constituents.

Amphotropin.—Amphotropin is the name given by Meister, Lucius & Brüning to hexamethylene-tetramine camphorate, a white, crystalline, light powder, soluble in water (1 in 10). It is given in doses of 7½ grains thrice daily for kidney and bladder troubles which are not of tuberculous origin.—*Chemist & Druggist*, 1912, v. 81, p. 123.

B. P. Arsenic Test.—The Pharmacopœia Committee of the General Medical Council has issued a Supplementary Report on the most suitable limit-test for arsenic in official substances and the limits for arsenic that may reasonably be adopted. This report is reproduced in abstract in the *Chemist and Druggist* (1912, v. 81. pp. 122–3). The recommendations made include the use of the "Gutzeit" test in an apparatus especially designed and to be described with illustrations in the Pharmacopœia. The proposed limits for arsenic in a number of official compounds are also given.

Aspirin Soluble.—Aspirin soluble is the calcium salt of aspirin and contains approximately 90 per cent. of aspirin and 10 per cent. of calcium. It occurs as a white powder that is readily soluble in water. Solutions of the salt on standing are decomposed with the liberation of acetic acid. It is, therefore, advisable to use only the freshly prepared solution which is practically tasteless.—*Pharm. Zentralh.,* 1912, v. 53, p. 786.

Commercial Calcium Glycerophosphate.—Puckner and Warren found the calcium content of five different samples to vary from 12.84 to 15.83 per cent., and the phosphorus content from 11.38 to 13.42 per cent. None of the specimens examined was completely soluble in water. Those which were nearly soluble were such as contained considerable quantities of an organic acid. On comparing the results found in the examination, with the standards prescribed in the foreign pharmacopœia and pharmaceutical commentaries, it was found that none of the specimens examined complied with all of the requirements in any one of these authorities.—*J. Am. Pharm. Assoc.,* v, 1. p. 749.

Camphora.—Gehe & Co. report that despite the fact that Japan has reduced the price on camphor the production of synthetic camphor is being continued, the manufacturers of celluloid and of smokeless powder appearing to prefer the synthetic product.—*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 231.

Chineonal is the name applied to a new chemical combination of quinine and veronal, said to be useful as a nerve sedative. The mixture is said to be a molecular one, 63.78 per cent. quinine and 36.22 per cent. veronal, or, in round numbers, two parts of the former to one of the latter. It occurs as a white, stable powder having a bitter taste. It may be given in doses of 0.6 gm., preferably in capsules and cachets.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 263.

Codeonal.—Stursberg is reported as being unable to recognize any appreciable advantages in the use of codeonal over extemporaneous combinations of codeine phosphate with veronal or diethylbarbituric acid. He states that a combination of codeine with diethylbarbituric acid appears to be of value as a sedative in cough.—*Therap. Monatsh.*, 1912, v. 26, p. 495.

Dioradin Treatment of Tuberculous Affections.—Wall, Cecil (*B. M. J.*, July 20, 1912, pp. 109–112) reports upon ten patients treated with dioradin. The cases were selected for the treatment with great care, and represented common types of the disease. In the opinion of the author none of the cases, although they were treated accurately in accordance with instructions, can be quoted to justify any claims for the therapeutic efficiency of dioradin.

Fagol.—Fagol is obtained by the condensation of creosote and formaldehyde. It occurs as a white crystalline powder that is odorless and readily soluble in water. It may be given in daily doses ranging from 0.5 to 3 grams.—*Pharm. Zentralh.*, 1912, v. 53, p. 718.

Hediosit.—Hediosit is the trade-name for the a-glykoheptonic acid lactone. It occurs in the form of powder and is prepared by the action of hydrocyanic acid on glucose, resulting in the production of a nitrile. It is readily soluble in water, less soluble in alcohol, and practically insoluble in ether.—*Pharm. Zentralh.,* 1912, v. 53, p. 718.

Hydroquinine Hydrochloride.—Hydroquinine differs from quinine by having two additional atoms of hydrogen, the composition being $C_{20}H_{26}N_2O_2.HCl + 2H_2O$. Hydroquinine occurs in minute quantities in cinchona bark and is closely related to quinine in chemical and physical properties. It has recently been prepared synthetically and is now being marketed as a substitute for quinine. —*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 351.

Hyperol.—Hyperol is a name applied to a hydrogen peroxide preparation in powder and tablet form.—*Therap. Monatsh.*, 1912, v. 26, p. 496.

Iridin is the name given to a resinoid in powder form derived from the rhizome of *Iridis versicoloris.*—*Südd. Apoth.-Ztg.*, 1912, v. 52, 263.

Linseed Oil.—Gehe & Co. report that the seed of the acacia tree is being utilized as a source of oil having the appearance of linseed oil.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 231.

Luminal.—Luminal or phenylethylbarbituric acid is being introduced as a hypnotic. It is said to be more active than veronal and less toxic. It may be given in doses of from 0.3 to 0.5 gm. The sodium salt which is freely soluble in water has been given hypodermatically in doses of 0.4 gm.—*Therap. Monatsh.*, 1912, v. 26, p. 494.

Narcophine.—Narcophine is the name given to a double salt—morphine and narcotine meconate—which is especially recommended as a narcotic for gynæcological purposes, similar in action to morphine and scopolamine, 30 drops of a 3 per cent. solution being used.—*The Chemist and Druggist*, 1912, v. 81, p. 123.

Neosalvarsan.—Preparation 914 is described as a condensation of salvarsan with sodium formaldehydsulphoxylate. It occurs as a yellowish powder having a peculiar odor and dissolving readily in water to form a solution of neutral reaction. The average dose for adults is given as from 0.45 to 0.9. Solutions should be freshly prepared with distilled water at room temperature and should under no condition be kept on hand but should be used immediately after being prepared, as the substance is readily decomposed.—*Pharm. Zentralh.*, 1912, v. 53, p. 635.

Ointment Bases.—Unna, Eugen, discusses the properties of the several ointment bases and summarizes them as follows:

	Odor	Consistence	Stability	Capacity for Liquids
Lard..............	existing	very soft	becomes rancid	very small
Suet..............	existing	rather soft	becomes rancid	very small
Petrolatum.....	none	soft	can be kept	small
Paraffin ointment..	none	soft	can be kept	small
Adeps lanæ.......	existing	greasy and sticky	becomes rancid	up to 200 per cent.
Eucerin...........	none	very soft	can be kept	up to 500 per cent.

—*J. Am. Pharm. Assoc.*, 1912, 1, 673–680.

Paratophan.—Paratophan is methylphenylchinolincarbonic acid, obtained by the condensation of paratoluidin, benzaldehyde, and pyroracemic acid. It occurs as a yellow crystalline powder, insoluble in water and soluble in alcohol, ether, and alkalies, and melts at from 204° to 205°. It is given in doses of 0.5 gram 4 to 6 times a day.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 415.

Isotophan.—Isotophan is methoxyphenylchinolicarbonic acid, obtained by the condensation of orthoanisidin, benzaldehyde, and pyroracemic acid. Isotophan occurs as a lemon-yellow crystalline powder, insoluble in water but readily soluble in alcohol and in alkalies. It melts at 216° and may be given in doses of 0.5 gram 4 to 6 times a day.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 415.

Pellidol.—Under this name Messrs. Kalle & Co. have introduced the diacetyl derivative of amidoazotoluene. It crystallizes in two forms—either in red needles melting at 65°, or in large crystals resembling potassium bichromate in appearance, melting at 75°. It is easily soluble in the usual organic solvents and is recommended as a powerful antiseptic for use in soaps or ointments.—*The Chemist and Druggist*, 1912, v. 81, p. 123.

Preservation of Rabies Virus.—Harris, D. L. (*Journal of In-*

fectious Diseases) outlines the following method for the preservation of rabies virus: The brain or cord of the rabid animal is ground up with water to a smooth paste, and then mixed with carbon dioxide " snow " and thus frozen hard. The brittle mass thus obtained is ground to a fine powder with a little more of the " snow," and is then placed in a beaker with a vessel of concentrated sulphuric acid within a vacuum jar half immersed in a freezing mixture of ice and salt. Complete drying is effected in from thirty-six to forty-eight hours. The dried powder is finally sealed up in suitable quantities in glass tubes. It is claimed that at the low temperatures used no loss of virulence occurs, and that subsequent loss is so slow that the material can be standardized for accurate dosage. —*Pharm. J* (Lond.), 1912, v. 89, p. 98.

Ristin.—Ristin is a new remedy for itch, prepared by Baeyer. It is a monobenzyl ester of ethylene glycol in 25 per cent. alcoholic solution with glycerin.—*The Chemist and Druggist,* 1912, v. 81, p. 123.

Sodium Phenyldimethylpyrazonamidomethansulphonate, an antipyrine derivative, also known as Melubrin, is being introduced as an antipyretic.—*Therap. Monatsh.,* 1912, v. 26, p. 495.

Trivalin.—Trivalin is the name applied to a molecular combination of valeric acid with morphine, caffeine, and cocaine. It is recommended for administration subcutaneously.—*Therap. Monatsh.,* 1912, v. 26, p. 495.

Zebromal.—Zebromal is the trademark name for a bromine preparation said to be the ethyl ester of phenyldibrompropionic acid or cinnamic acid ethyl ester dibromide, obtained by brominating cinnamic acid ester. Zebromal occurs as a white crystalline powder having a faintly aromatic odor and taste. It melts at from 70° to 75°, and is insoluble in water, readily soluble in ether and chloroform and slightly soluble in alcohol. The bromine content is approximately 47.5 per cent. It has been recommended as a substitute for the alkaline bromides and may be given in doses of from 1 to 2 grams daily.—*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 415.

BOOK REVIEWS.

VOLUMETRIC ANALYSIS. For students of Pharmaceutical and general chemistry. By Charles H. Hampshire, Demonstrator in

Chemistry at the School of Pharmacy of the Pharmaceutical Society of Great Britain. Philadelphia: P. Blakiston's Son & Co. 1912. $1.25 net.

This work while originally planned to provide a course in volumetric analysis for pharmaceutical students has been somewhat enlarged and made useful for other students in chemistry. It is based upon the requirements of the British Pharmacopœia and includes chapters upon the following subjects: Acidemetry and alkalimetry; indicators and source of errors in using them; determination of acidemetry and alkalimetry using sulphuric acid, sodium hydroxide, potassium permanganate, potassium dichromate, iodine and sodium thiosulphate; precipitation reactions and miscellaneous exercises are also given.

The subject matter is well presented and has been carefully prepared. While there are very many books treating of volumetric analysis there are a number of excellent features that commend this work to the beginner in analytical chemistry.

Treatise on Commercial Pharmacy, intended as a Reference Book and a Text-Book for Pharmacists and their clerks. By Charles O'Connor. Philadelphia and London: J. B. Lippincott Company.

This work was written for the purpose of giving pharmacists a practical book by the use of which they can reorganize their methods and put their business on a paying basis. The author takes into consideration all of the features which have been the means of making the business to-day less profitable than heretofore, and he has attempted to supply a guide for the successful financial management of any pharmacy. The book is divided into 3 parts: (1) Pharmacy establishment; (2) pharmacy management; (3) pharmacy development. Under pharmacy establishment there are 9 chapters dealing with financing, planning, arranging, present and future problems. Some 21 chapters have to do with pharmacy management in which the following subjects are practically discussed: thorough knowledge of one's business, business economies, system and store service, buying goods and salesmanship. In the last part, treating of pharmacy development, there are some 18 chapters in which are considered the following subjects: advertising, window displays, special sales and side lines, and business building.

There are very many who contend that the future of the pharmacist lies in the development of the commercial aspects of pharmacy. Those who view the subject in this way will agree with Mr. O'Connor when he says:

"As the cry for commercialism is strong nowadays, and it has made such great inroads in the calling of pharmacy, it would seem that the time is now ripe for the publication of a book treating of commercial problems pertaining to the calling of pharmacy."

The book contains a large amount of practical information and while we feel that in some instances better subjects might have been selected to illustrate the work, yet they show the point of view of the author and emphasize what he means by "Commercial Pharmacy." It is a timely work and well worth careful reading and study on the part of the proprietor as well as the apprentice.

FORMULÆ MAGISTRALES GERMANICÆ (*F. M. G.*) Im Auftrage des Deutschen Apotheker-Vereins. Bearbeitet von Professor Dr. L. Lewin. Herausgegeben vom Deutschen Apotheker-Verein. 1912. Selbstverlag des Deutschen Apotheker-Vereins.

This work is a collation of the various formulæ that have been used in various parts of Germany. There are nearly 600 different formulæ given and the book is well indexed. It is really an indispensable work and should be in the hands of all pharmacists. With this book and the German Pharmacopœia in his library any pharmacist in the United States could be able very likely to compound any of the prescriptions of a German physician and supply the medicines demanded by Germans in the ordinary course of trade.

ANNUAL REPORT OF THE SURGEON GENERAL OF THE PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE OF THE UNITED STATES FOR THE FISCAL YEAR 1911. Washington: Government Printing Office, 1912.

A careful perusal of the Report of the Surgeon General shows that the operations of the United States Public Health and Marine-Hospital Service are of the greatest magnitude and the greatest possible benefits to the American people. The Bureau in Washington contains 7 divisions, through which the widely varied operations of the service are conducted. Some idea of the work of service may be gleaned by excerpts concerning the activities of some of these divisions.

1. Scientific research and sanitation, including the investigations concerning typhoid fever and the study of methods for the prevention of the same in many different parts of the United States. Special studies are also conducted as those relating to pellagra, hookworm, cerebrospinal fever, Rocky Mountain spotted fever, etc. Special scientific investigations furthermore are conducted in Washington in the several divisions of the Hygienic Laboratory and include a great variety of subjects, some of these are those relating to the standardization of the doings of the U. S. Pharmacopœia, etc., which our readers are quite familiar with.

2. Foreign and Insular Quarantine and Immigration. This includes quarantine against cholera, rat quarantine, measures to prevent smallpox from Pacific ports entering Alaska, as well as the large question of insular and foreign quarantine. In administering maritime quarantine during the year 1911 the service has inspected a total of 15,160 vessels at the domestic and insular quarantine stations and at foreign ports. Of this number 1,801 were fumigated or disinfected either on account of actual infection or for the destruction of disease carriers, such as rats and mosquitoes. Passengers and crews to the number of 1,516,445 were also inspected to determine whether they were infected with any of the diseases quarantineable under the Treasury regulations.

3. Domestic and Interstate quarantine. In this division plague-suppressive measures in California and near-by States were carried out on a rather extensive scale. Studies were also made on the outbreaks of smallpox in various parts of the United States, and effective measures were adopted to prevent the entrance into the United States of cholera and the plague.

4. Marine Hospitals and Relief. During the year 1911, 52,209 seamen were treated at the various stations of the service as were also 1,003 seamen from foreign vessels. The service operated 23 hospitals all of which are owned by the Government, and maintained 120 other relief stations where hospital and dispensary relief were furnished.

5. Publications. During the year 1911, 335,544 copies of the various service publications were distributed. These included annual reports of the Surgeon-General, Weekly Public Health Reports, reprints from Public Health Reports, Public Health Bulletins, Hygienic Laboratory Bulletins, Bulletins of the Yellow Fever

Institute, and certain miscellaneous publications. The bulletins of the Hygienic Laboratory show the wide scope of the investigations made in the 4 divisions of this laboratory. Of these the following may be mentioned as being of very great interest to pharmacists:

Bulletin No. 70. A study of the melting point determinations with special reference to the melting point requirements of the United States Pharmacopœia. By George A. Menge.

Bulletin No. 73. The effects of a number of derivatives of choline and analogous compounds on the blood pressure. By Reid Hunt and R. deM. Taveau.

Bulletin No. 74. Digitalis standardization and the variability of crude and of medicinal preparations. By Worth Hale.

Bulletin No. 75. Digest of Comments on the Pharmacopœia of the United States of America and the National Formulary for the calendar year ending December 31, 1908. By Murray G. Motter and M. I. Wilbert.

Bulletin No. 76. The Physiological Standardization of Ergot. By Charles W. Edmunds and Worth Hale.

REPORTS OF THE CHEMICAL LABORATORY OF THE AMERICAN MEDICAL ASSOCIATION. Vol. 4, January–December, 1911. By W. A. Puckner, Director of the Laboratory Press of the American Medical Association, 535 Dearborn Ave., Chicago, Ill.

The chemical laboratory of the American Medical Association was established in the fall of 1906, to assist the Council on Pharmacy and Chemistry in its investigations by examining articles submitted to test the truth and accuracy of statements made regarding their composition.

In addition to the work growing out of the investigations of the Council, the laboratory has engaged to a certain extent in other lines of work. It occasionally takes up the examination of "patent medicines" regarding which reports of unfavorable therapeutic results have been received, or which are being advertised to the laity with absurd, extravagant and often dangerous statements. Many queries regarding the action of chemicals or the composition of pharmaceutical preparations and other questions of a chemical nature which are answered in *The Journal* are referred to the laboratory for reply or investigation.

Increasing interest is being shown by physicians, pharmacists and chemists in the composition of, and methods of analyzing, medicines in general—and in view of such interest the Reports the Chemical Laboratory are published to give in compact form the results of analyses and the methods employed.

The present volume includes reports of the work of the past year. Of special interest to drug-analysts, the methods of analysis of Hesperian Tonic and Sulphume may be noted; teachers of materia medica and of chemistry who wish to discuss the adulteration and sophistication of drugs before their classes will find the reports on Tablets of Opium, Phenol and Bismuth, Iodo-resorcin sulphonate of interest; and those who are interested in the enforcement of drug laws should note the articles on Plantoxine, En-Ar-Co Oil, Liquid Life, Mayr's Wonderful Stomach Remedy and Thatcher's Worm Syrup.

Besides analytical work, the laboratory has taken up constructive work, looking towards the establishment of standards for little used drugs, examples of which may be found in the studies on Dried Magnesium Sulphate, and Calcium Phenolsulphonate. This work should be familiar to pharmacists and, it is hoped, will also be considered by manufacturers. The working method given for the preparation of quinin tannate should be of direct value to pharmacists who wish to dispense that which is best on prescriptions, while the studies on incompatibilities should be of interest alike to prescribers and dispensers. The arrangement of the material is the same as in previous years, viz.:

(*a*) Contributions of the Chemical Laboratory of the American Medical Association;

(*b*) Chemical Data contributed to *The Journal of the American Medical Association* by the Laboratory;

(*c*) Unpublished Work of the Laboratory.

A CRITICAL REVISION OF THE GENUS EUCALYPTUS. By J. H. Maiden, Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney. Published by Authority of the Government of the State of New South Wales. Sydney: William Applegate Gulick, Government Printer.

Up until the present time 14 parts of this valuable work have appeared. Some 72 species of Eucalyptus have been described, the descriptions being illustrated with beautiful lithographic drawings. As has been previously pointed out in this JOURNAL, scarcely any genus of trees are so extensively cultivated and command such universal interest as these of Eucalyptus.

ANNALES DU MUSÉE COLONIAL DE MARSEILLE. Dix-huitième année, 2e serie, 8e volume 1910. Marseille: Musée Colonial, 5 Rue Noailles. 1910.

The annals of the Colonial Museum founded by Prof. Dr. Edward Heckel and published under his direction always contains articles that are of very great interest. The present volume contains an excellent monograph of nearly 400 pages on "The Useful Plants of Madagascar" by Prof. Edward Heckel. It also contains an article "Biological Fragments relating to the Flora of Madagascar" by Henry Jumelle and H. Perrier de La Bathie. In the latter paper there are some interesting morphological observations concerning a number of plants of the genera Adansonia, Dioscorea, Coffea, etc. In the monograph on the useful plants of Madagascar Prof. Heckel has arranged the plants according to their native names, giving their botanical origin and family names, as well as a number of facts regarding their uses. It is a very important contribution to our knowledge of the useful plants of the tropics and will be found useful to all students of the flora of tropical countries.

PLANT CHEMISTRY FOR PHARMACY STUDENTS. By Nellie Wakeman, Department of Chemistry of the University of Wisconsin. Published by the University. 1911. 35 cents.

This work is intended as a guide for students in plant chemistry. In it are given a large number of experiments that can be carried out by students in pharmacy. These are supplemented by references to the important literature. There is also a prefatory note in connection with each subject that will be found suggestive to both teacher and student. Methods for the examination and determination of the following constituents are taken up in detail: water, inorganic constituents and ash, oleoresins, resins, volatile oils, fatty oils, carbohydrates and related compounds, alkaloids, glucosides, tannins, and plant pigments.

This is one of the most stimulating pamphlets, as it relates to the development of pharmaceutical education, that has come to our notice. A laboratory course, the kind outlined in Miss Wakeman's monograph, supplementing the instruction in botany and pharmacognosy, must be of incalculable benefit to students in pharmacy. Instead then of the student worrying about the "commercialization of pharmacy" his thoughts will be directed to the science and art of a profession upon which mankind at least in part depends for its very life.

PHARMACOLOGY AND THERAPEUTICS FOR STUDENTS AND PRACTITIONERS OF MEDICINE. By Prof. H. C. Wood, Jr. Philadelphia and London: J. B. Lippincott Company. $4.00.

The author has endeavored in this book to emphasize the mutual interdependence between pharmacological science and the clinical application of drugs. There is no question but that if the practice of medicine is to advance it must be on the basis of the application of the scientific results obtained in the laboratories of the pharmacologist and physiologist. Any work which makes an attempt in this direction is deserving of the appreciation of students in medicine. Indeed it is a task deserving the attention of a master-mind. We are not sure that the author has been fortunate in including in this work a consideration of the physical properties of drugs, as is seen in the numerous errors in this part of the book, insignificant though they may be to the medical student. By continuing the physical properties of drugs, with their physiological action and their application in therapeutics, the author has written a book that as a matter of fact is not so markedly different from the earlier works on "Materia Medica and Therapeutics" and which he rightly claims are "fundamentally at variance with modern ideas and that it is almost impossible to make them to conform to the needs of the present day student." It is quite likely, however, that Dr. Wood has included the extended descriptions of drugs in his text-book because of conditions that still exist in the curriculum of our medical colleges.

Dr. Wood's book is divided into nine chapters in which the following subjects are considered: Preliminary considerations; drugs used to affect secretion, the nervous system, the circulation and the alimentary tract; drugs affecting metabolic processes; drugs acting on the causes of disease; extraneous remedies; and drugs of minor importance. The classes of drugs are considered in a general way somewhat as follows: There is usually a prefatory and explanatory note of each class of drugs. The drugs are frequently grouped together as those of "the atropine group," in which some general consideration is given regarding the chemical nature of the constituents. Then under the respective drugs the information that is given may be divided under the following divisions: Materia medica including physical descriptions of the drug and a brief consideration of the official preparations; the physiological action of the drug, its therapeutic uses and toxicology.

The author has collated a large amount of valuable information which he has arranged in logical sequence and presented in an interesting manner. It is much superior to any of the American works that are employed in most of the medical colleges and no doubt will be largely used as a text-book.

AN ESSAY ON HASHEESH, including Observations and Experiments. By Victor Robinson. New York: Medical Review of Reviews, 206 Broadway. 50 cents postpaid.

This is one of the most interesting books that has found its way to the Editor's table. He must confess that on opening its pages late one night he did not lay down the book until he had read it throughout. The author's command of English and selection of scientific facts, together with his own studies on Cannabis Indica has given us an unusually interesting monograph of one of the most curious drugs in the Pharmacopœia. Mr. Robinson has studied this drug from the historical, chemical, botanical, physiological, psychological, therapeutic and pharmacological viewpoints.

THE CHEMISTS' DICTIONARY OF SYNONYMOUS AND TRADE NAMES. Published at the offices of *The Chemist and Druggist*, 42 Cannon Street, London, E. C.; and at Melbourne, Sydney and Adelaide, Australia.

This work is made uniform with "The Chemists' Dictionary of Medical Terms and Treatment," and contains in 221 pages probably over 5000 names. It is very compact and contains much useful information. Like the other publications of *The Chemist and Druggist*, "The Chemists' Dictionary of Synonymous and Trade Names" will be found extremely valuable to pharmacists and chemists.

POISONS AS PLANT DEFENSES.[1]

That many plants secrete, in root, stem, leaves, flowers, or fruit, chemical substances capable of potent effect on the bodies of animals is of course a well-known fact. Indeed, it was one of the first things studied by the human animal in his upward climb, and among all savages the knowledge of the properties of medicinal herbs is one of the most important assets of the priestly class, or "medicine men." But it is only of recent years that extended study has been devoted to the action of such plants on the lower animals. The important discovery has thus been made that such substances, which are more or less poisonous, are elaborated by the plant for the express purpose of protection against enemies. Some of the earliest investigations in this line were made by the German naturalist, E. Stahl, and described in his work on "Plants and Snails." One of his students, W. Peyer, has just published the results of his studies under the title of "Biologic Investigations of Protective Products," a review of which we find in the *Naturwissenschaftliche Rundschau* (Berlin). Peyer has studied mice and rabbits instead of snails, which makes his results more important from the viewpoint of human biology. His method was to offer the animals both fresh plants or parts of plants, and similar ones from which the essential chemical compounds had been removed by repeated extraction with alcohol or acidulated water. In most instances rabbits refused to touch the fresh plants. After 24 hours of hunger the animals ate some of them, but even then refused the parts containing the most of the defensive substance.

> "With respect to the barberry, the animals discriminated between different parts according to the greater or less amount of berberine contained. The bark of the roots, which is rich in berberine, was scorned, the bark of the stem, which contains a smaller amount, was tasted, and the leaves, which hold very little, were eaten."

Peyer also made personal observations in the Harz and extensive inquiries among the herdsmen and forest people of that region, many of whom, he remarks, are keen observers of nature and possess an excellent knowledge of plants. Out of 52 alkaloidal and glucoside-bearing plants found on the grazing grounds, 4 were eaten without hesitation and 14 were swallowed with other herbage under pressure of haste or hunger. It was observed likewise that most of these plants bore scarcely any trace of attack by chafers. There can be no doubt, the writer thinks, that in the alkaloids and glucosides plants possess powerful weapons against their enemies.

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[1] *The Literary Digest*, Aug. 3, 1912, pp. 184, 185.

The experiments with acid-bearing plants are of great interest because so many of these are used for human food, in the form of salads or spring vegetables. The results obtained by Peyer with rabbits and acid plants correspond closely to those of Stahl with snails, except that the rabbits were less sensitive than the snails. Oxalic acid was the one principally observed, though Peyer also made tests with citric and tartaric acids. According to these tests acids furnish an excellent means of protection to plants, and observations in the meadows confirmed this view. Plants containing ethereal oils were likewise avoided by animals. If the leaves of such plants were bruised so as to tear the oil-glands and then rubbed upon attractive food or placed in contact with it for a time rabbits refused the food until the objectionable oil had entirely evaporated. To quote further:

> "Significant, also, is the fact that the oil-glands are found in mere seedlings. Snails to which seedlings of eight of the common aromatic plants were offered, attacked the tiny plants very slightly or not at all, and never when other food was to be had. But if the plants were extracted with alcohol and then dried they were quickly eaten.
>
> "On the pastures Peyer and other observers found the oil-bearing plants avoided almost without exception. Such plants cultivated for medicinal uses he found to be never injured by either wild or grazing animals.
>
> "Many umbelliferous fruits are poisonous to grain-eating birds; but they were greedily devoured after being extracted with alcohol."

Most valuable of all, perhaps, were the investigator's experiments with leguminous seeds, including beans, peas, and lentils, since these form a large part of our daily diet, and are everywhere recognized as exceptionally nourishing, besides being moderate in price. These seeds contain a chemical substance whose exact nature still remains unknown, but which is so poisonous as to prevent mice and rabbits from touching them. This avoidance, the author notes, is not due to the hardness of the shells, since soaked or boiled seeds also are not eaten. A significant circumstance, which housewives and the great canning factories would equally do well to note, is that when the experimenter changed several times the water in which these seeds were cooked, thus eliminating the toxic principle, the animals ate them immediately. When the seeds were ground to powder and extracted with alcohol or ether, the residue was promptly eaten. A confirmatory experiment was made by using the alcoholic or ethereal extract thus obtained to moisten the favorite food of the animals—clover for the rabbits and crumbs of zwieback for the mice. Food thus treated they rigidly abstained from. Further tests with pure alcohol and ether proved that the deterrent cause did not proceed from the liquids themselves. Says the reviewer:

> "The active principle concerned seems to be volatile, for on distilling the seeds with water the first 10 or 15 cubic centimetres obtained had a particularly strong repellent action. Similar distillates of grain and sunflower seeds did not prevent the feeding of the animals."

Another notable observation of Peyer was that many seedling roots secrete an acid product. It was noted that snails refused the roots of various seedings unless they were washed off with water. After half an hour or so they were again refused, presumably because they had excreted a fresh supply of acid.

These seedling roots included maize, rye, oats, buckwheat, peas, etc. But they were eaten without exception after soaking for half an hour in a dilute solution of soda, or after boiling for five minutes. The snails even refused to touch filter paper that had been in contact with the seedling roots. Besides these chemical means of protection Peyer investigated certain mechanical means of protection. Thus cork-layers and hairy surfaces are very deterrent to mammals as well as to snails, and a slimy juice is offensive both to snails and to rodents, which explains its usefulness in the stalks and leaves of various plants and in such seeds as flax, quince, etc. He concludes that these substances are disagreeable to the animals.

Lastly Herr Peyer discusses the *raphides*, which are tiny bundles of needle-like crystals of calcium oxalate found in many plants. He supports Stahl in his view, which had been attacked, that these are a means of protection, as they are offensive both to snails and the higher animals, including men. Their effect is due to their mechanical action in penetrating the mucous membrane.

THE AMERICAN
JOURNAL OF PHARMACY

OCTOBER, 1912

THE EXAMINATION OF SOME DRUGS WITH SPECIAL REFERENCE TO THE ANHYDROUS ALCOHOL AND ETHER EXTRACTS AND ASH.

By J. R. Rippetoe, P.D., and R. Minor, Phar. D.

In the examination of a number of commercial samples of vegetable drugs in addition to identifying the samples and making specified tests for added or accidental impurities, such as starch, etc., we have attempted to make some assays that would serve as a means of determining the relative value of the sample when compared with some other sample or standard.

These assays have consisted chiefly in determining anhydrous extracts, using as menstruum, water, alcohol, alcohol and water, ether, chloroform or petroleum ether, as may be suggested by the nature of the drug. Some of the drugs included in this report have established extract standards; for example: aloes, gambir and gamboge by the U. S. P., and the spices, such as capsicum and cloves by the government.

The determination of the anhydrous soluble or insoluble matter of a drug may not directly estimate its therapeutic activity, but in the absence of any other means of determining its therapeutic value, without a doubt, the physician would prefer to use a preparation made from a good grade of drug assaying 25 per cent. anhydrous extract with the proper menstruum than a similarly good grade of the same drug assaying 15 per cent.

For the manufacturer, it serves to enable him to select a drug that will give a high yield of extract, thereby making a good product, in the case of solid or powdered extracts or a rich appearing preparation, as in the case of fluidextracts, tinctures, etc.

For the chemist, it serves as an aid in identification or comparison of a sample, especially a ground or powdered sample, with a standard selected from a good grade of whole drug; the determination of partial extraction of the drug, as we have found in capsicum; deterioration due to faulty storage or packing, as in drugs rich in volatile substances or fixed oils; or inferiority due to added or accidental impurities which do not yield soluble constituents to the menstruum used.

In making these statements we recognize the fact that a drug may assay high in extractive matter and at the same time contain a low percentage of the principles that give it its chief therapeutic activity.

As stated above, the drugs included in this report were samples submitted for examination which were chiefly in a ground or powdered state. For comparison, samples of selected whole drug were examined in the same manner and the results taken as standards. This examination of selected whole drugs has necessarily been limited, and the figures have to be given considerable latitude until a sufficient number of selected samples from various sources and different seasons can be assayed.

The drugs containing alkaloids have been found to vary in their alkaloidal content with different seasons and from different localities, and it can be assumed that many drugs will vary likewise in their extract content.

Several of the drugs included in this report contain alkaloids or other principles which may be approximately determined and serve as a means of judging of their value. Owing to lack of time, we have given the determination of these constituents very little attention as yet.

METHODS.—DETERMINATION OF ANHYDROUS EXTRACT: Transfer 2 grammes of the sample in fine powder (or not less than No. 40 powder) to an eight ounce flint bottle stoppered with a best grade cork. Add 100 Cc. of the menstruum, mix thoroughly and set aside 12 to 18 hours (over night), shake in mechanical shaker for 3 hours and then set aside for a few minutes to settle. Filter through a fluted filter. If the filtrate is cloudy a small quantity of kieselguhr may be of some aid in obtaining a clear filtrate. Transfer 50 Cc. of the filtrate representing 1 gramme of the drug to a tared 5 oz. beaker, evaporate on water bath and dry to constant weight at 100° C. If the extract content is high it is advisable to use less of the filtrate. Where the alcoholic menstruum used in determining the anhydrous alcohol extract was of a percentage other than 95 per cent. absolute alcohol, the percentage is indicated by the figure in brackets; for example, arnica flowers (10079) contained 20.63 per cent. with a dilute alcohol menstruum (49) [20.63 (49)].

INSOLUBLE MATTER is determined by collecting on balanced filters, washing with the menstruum until the washings are free from extractive and drying the residue at 100° C.

THE VOLATILE ETHER EXTRACT is determined by allowing the 50 Cc. of the filtrate in the tared beaker to evaporate spontaneously and then drying in a vacuum desiccator over sulphuric acid at room temperature to constant weight. The extract is then dried to constant weight at 100° C. The loss of weight in the last operation is calculated to volatile ether extract and the residue in the beaker to anhydrous ether extract.

MOISTURE, or loss in weight upon drying, is determined by weighing about 1 gramme of sample into a 5 oz. tared beaker or a 3 inch watch glass and drying either at 100° or 105° C.

ASH is determined by igniting in either a platinum or silica crucible, usually platinum, with the aid of a blast.

The results of the assays are given in the table on pp. 436–444.

Aloes.—The determination of the anhydrous aqueous extract is very unsatisfactory, owing to the difficulty of obtaining check assays. The figures given in the table are approximate only.

Benzoin.—The Sumatra benzoin which usually contains cinnamic acid can be distinguished[1] from Siam benzoin, which does not contain cinnamic acid by heating a small quantity with a little soda and water and warming the filtrate with potassium permanganate, when the odor of bitter almonds will be developed.

Cannabis Indica.—The sample (9826) referred to in the table and found to contain 36.58 per cent. seed, was tested physiologically, after removing the seeds, by feeding a 13 kilo dog with the extract from 2 gms. It compared very favorably with a selected sample.

Colocynth.—Sample 9548 containing 96.63 per cent. pulp, 1.27 per cent. seed and 1.80 per cent. peel, showed other than pulp tissue, stone cells from the peel and a few aleurone grains from the seed. Samples 9674 and 9675 containing 1.17 and 0.79 per cent. seed and 0.50 and 0.16 per cent. pulp, respectively, showed practically no aleurone grains or stone cells.

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[1] A. Pharm., 1892, CC XXX thru U. S. D., 19th edition. 232.

TABULATION OF ASSAYS.

Sample	Sample No.	Moist	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. Dil. HCl	Remarks
		Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*		
Acacia Pow.	9,917	10.09				2.35		
Acacia Pow.	9,967	9.88				2.47		
Acacia Pow. 1st	10,040	9.43				2.48	Soluble	
Acacia Pow. 2nd	10,092	9.89				2.68	Soluble	
Acacia Pow. 2nd	10,438	9.02				2.55	Soluble	
Acacia Pow. 1st	10,577	9.12				2.62	Soluble	
Acacia Gran. 1st......	10,670	11.85				2.52	Soluble	
Allspice Pow.	10,477		11.05		6.26	3.64		Vol. Ether Ext. 2.1%
Aloes Barb. Pow.	9,706	4.67	90.20	66.05				
Aloes Barb. Pow.	10,180	7.19	83.07	68.72		2.56	Pract. all	
Aloes Barb. Pow.	10,740	10.60	87.25	72.76		1.09	Soluble	
Aloes Cape Pow.	9,687	5.42	91.45	64.19				
Aloes Cape Pow.	10,198	5.37	94.17	59.80		0.65		
Aloes Cur. Pow.	10,432	5.43	91.73	68.30		1.84		
Aloes Cur. Pow.	10,629	12.94	85.95	75.09		1.46	Soluble	
Aloes Soc. Pow.	9,782	5.64	89.15	37.84		5.65	Pract. all	
Aloes Soc. Pow.	10,210	5.72	82.52	34.80		4.80		
Aloes Soc. Pow.	10,240	5.80	85.83	49.58		1.59		
Aloes Soc. Pow.	10,241	5.30	82.44	54.37		4.15		
Althaea Rt. Cut......	9,810					6.86	Soluble	
Althaea Rt. Cut......	9,811					6.95	Soluble	
Angelica Seed Grd....	9,852					6.90	Pract. all	
Anise Seed Pow.	10,668		26.77		27.90	5.85	Soluble	
Arnica Fl. Grd........	10,079		20.63(49)			8.72	Pract. all	
Arnica Fl. Grd........	10,091		20.62(49)			8.22	Pract. all	
Balsam of Tolu.......	10,000		98.75[1]					Alc. insol. 1.25%
Balsam of Tolu.......	10,044		98.66					Alc. insol. 1.33%
Balsam of Tolu.......	10,085		98.50			0.54		Alc. insol. 1.50%
Balsam of Tolu.......	10,316		99.05			0.30		Alc. insol. 0.95%
Benzoin Siam.........	10,031		94.22[1]			0.50	Pract. all	Alc. insol. 5.78%

Benzoin Siam........	10,032		92.63			0.65	Pract. all	Alc. insol. 7.37%
Benzoin Siam........	10,033		92.78			0.80	Pract. all	Alc. insol. 7.22%
Benzoin Siam........	10,034		90.89			0.60	Pract. all	Alc. insol. 9.11%
Benzoin Siam........	10,057		84.98			0.90	Pract. all	Alc. insol. 15.02%
Benzoin Siam........			89.35			1.25	Pract. all	Alc. insol. 10.65%
Benzoin Siam........	10,388		93.60			0.66		Alc. insol. 6.40%
Benzoin Sum. Pow. ..	9,355		85.24			0.83		Alc. insol. 14.76%
Benzoin Sum. Pow. ..	9,542		76.00			1.85		Alc. insol. 24.00%
Benzoin Sum. Pow. ..	10,566		74.75			1.48	Soluble	Alc. insol. 25.25%
Calumba Rt. Pow. ...	9,445		10.38(65)			6.06		
Calumba Rt. Pow. ...	9,830		12.25(65)			6.36	Pract. all	
Calumba Rt. Pow. ...	10,469		12.55(65)			6.10	Pract. all	
Cannabis Indica......	9,826		11.76					Garbled = 36.58% Seed
Cannabis Indica without seed...........	9,826		15.03		12.10			
Cannabis Indica Seed.	9,826		6.10		30.50			
Cannabis Indica......	10,161		13.11			14.44		
Cannabis Indica......	10,328		13.50					
Cannabis Indica Grd .	10,162		12.57			14.20		
Cantharides Pow.	9,421	9.29	20.94			6.50		
Cantharides..........	10,198	7.00	20.56			6.40		
Capsicum Grd........	9,680	5.78	21.48		17.78	5.36		
Capsicum Grd........	9,681	6.85	7.80		4.01	6.40		Sample from grocery store
Capsicum Grd........	9,937	7.11	19.95		17.38	4.79		
Capsicum Pow.	10,116	7.74	21.72		15.31	5.76	Pract. sol	Vol. Ether Ext. 3.30%
Capsicum Pow.	10,701	5.62	27.20		19.82	6.00	Pract. sol.	Vol. Ether Ext. 1.61%
Capsicum Pow.	10,827	6.76	21.84		13.37	6.31	Pract. sol.	Vol. Ether Ext. 0.87%
Cardamom Wh.......	10,507A		4.45		2.28	3.65	Partly sol.	Garbled = 72% Seeds 28% hulls
Cardamom Seed.......	10,507A		2.70		1.62	4.04	Mostly insol.	
Cardamom Hulls......	10,507A		8.20		3.80	0.24	Partly insol.	
Cardamom Hulls......	10,507B		9.25		4.40			Hulls from whole sample cont. 73% Seed

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[1] Alcohol extract calculated from difference, sample taken and alcohol insoluble.

TABULATION OF ASSAYS.—*Continued.*

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. Dil. HCl	Remarks
	Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*		
Cardamom Seed......	10,507B		3.10		2.10			
Cardamom Seed Pow.	10,439		4.55		2.02	7.60	Insol.	Vol. Ether Ext. 1.00%
Cardamom Seed Pow.	9,419					7.55		
Cardamom Seed......	10,590		8.93		2.89	4.86	Mostly insol.	
Cascara Sag Grd.....	10,532	6.70		25.00		4.82	Soluble	
Cascara Sag. Pow.....	10,471			28.18		4.14	Soluble	
Cascara Sag. Grd.....			27.80(39)					
Catechu Pow.........	10,166	10,56	65.75			2.86	Mostly sol.	
Catechu Pow.........	10,473	9.22	65.25			2.51		
Caulophyllum........	9,439		24.64(72)			8.55		
Celery Seed Pow......	9,627		29.90		30.23	9.11	Partly sol.	
Celery Seed..........	10,756		21.44		25.45	12.18	Partly sol.	Vol. Ether Ext. 1.50%
Celery Seed Pow......	10,816		23.90		21.10	14.50	Partly sol.	Vol. Ether Ext. 2.54%
Cinnamon Cassia Wh.	10,763		8.40		1.96	1.79	Soluble	Vol. Ether Ext. 0.74%
Cinnamon Cas. Pow..	9,853		7.43		2.88	3.02	Mostly sol.	
Cinnamon Cas. Pow..	9,963		8.79		2.60	3.50	Mostly sol.	Vol. Ether Ext. 0.88%
Cinnamon Cas. Pow..	9,964		7.55		2.95	3.16	Soluble	Vol. Ether Ext. 2.45%
Cinnamon Cas. Pow..	10,702		6.57		1.30	2.23	Soluble	Vol. Ether Ext. 3.55%
Cinnamon Ceylon Wh.	10,765		10.84		1.66	3.54	Soluble	Vol. Ether Ext. 0.54%
Cinnamon Saigon Wh.	10,764		6.01		1.74	2.47	Soluble	Vol. Ether Ext. 2.56%
Cinnamon Saigon Pow.	9,551		7.55		2.90	3.30		Vol. Ether Ext. 1.70%
Cinnamon Saigon Pow.	10,815		6.57		3.36	3.80		Vol. Ether Ext. 2.16%
Cloves Wh. free from stems...........	10,757		15.40		7.30	4.00	Soluble	Vol. Ether Ext. 18.45% cont. 4.8% stems
Cloves Pow..........	10,055	22.24^2	15.61		7.40	5.34	Soluble	Vol. Ether Ext. 10.46
Cochineal Pow.......	10,050	6.98				4.97	Mostly insol.	Tests for foreign colors–negative
Cochineal Pow.......	10,433					3.60		
Colocynth^3 Apple Grd.	9,238		22.00(49)					
Colocynth Apple Wh..	9,450		14.22(49)			3.73		Pet. Ether Ext. 12.58%

Colocynth Apple Pulp	9,450		43.20(49)			9.20	Soluble	Pet. Ether Ext. 0.44%
Colocynth Apple Seed	9,450		5.2 (49)			1.96	Mostly insol.	Pet. Ether Ext. 15.56%
Colocynth Pulp....... with seed...........	9,548		42.55(49)			13.03	Soluble	Pet. Ether Ext. 0.77%
Colocynth Pulp, no seed	9,548		43.46(49)			13.03	Soluble	Pet. Ether Ext. 0.65%
Colocynth Pulp, no seed	9,674		40.00(49)			12.68	Soluble	Pet. Ether Ext. 1.00%
Colocynth Pulp, no seed	9,675		42.75(49)			12.10	Soluble	Pet. Ether Ext. 0.64%
Colocynth Pow.......	9,395		29.49(49)			6.12		Pet. Ether Ext. 4.40%
Colocynth Pow.......	9,510		31.90(49)			9.87		Pet. Ether Ext. 1.21%
Colocynth Pow.......	9,511		39.51(49)			12.68		Pet. Ether Ext. 0.74%
Conium Lvs. Pow. ...	10,470					15 66	Mostly sol.	
Coriander Wh........	10,758		21.20		21.50	5.49	Soluble	Vol. Ether Ext. 0.30%
Coriander Pow.	9,860					7.20	Mostly sol.	
Cubeb Pow.	10,068		9.26		7.39	6.00	Mostly sol.	
Dragons Blood Reed..	A		55.98		55.34	3.53	Mostly insol.	Color deep vermil. red
Dragons Blood Lump.	B		72.20		64.52	3.60	Mostly insol.	Color deep vermil. red
Dragons Blood Pow...	9,854	1.95	79.05		74.04	3.35	Mostly insol.	Color deep vermil. red
Dragons Blood Pow...	10,144		75.18		76.54	4.22	Mostly insol.	Color light rose
Dragons Blood Pow...	10,174		74.28		79.40	3.96	Mostly insol.	Color light rose
Dragons Blood Pow. .	10,817		62.30		64.66	9.15	Mostly insol.	Color light rose
Elder Flow. Grd	9,847		2 .15(49)			7.65	Pract. sol.	
Fennel Seed..........	10,508				16.95	7.93		
Fennel Seed Pow.	10,445				16.00	8.45		
Fenugreek Pow.	9,848		12.45		7.40	4.55	Pract. sol.	Pet. Ether Ext. 6.26%
Galangal Rt..........	9,463		9.19			5.33		
Galangal Rt. Pow. ...	9,418					5.38		
Galangal Rt. Pow. ...	10,013		10.04			7.12		
Gambir Gran.........	10,259	6.64	64.60			8.74	Partly sol.	
Gambir Gran.........	10,335	5.96	64.50			9.23	Mostly insol.	
Gambir.............	10,569	38.91				3.57		Alc. insol. 13.45%
Gambir.............	10,784	43.02				3.03		Alc. insol. 21.27%
Gamboge Pow.	10,446		76.05			0.75		
Gamboge Pow.	10,768		76.09			1.22		
Gentian Rt. Pow.	9,972		40.89(49)			3.40	Mostly sol.	
Gentian Rt. Grd......	10,090		40.00(49)	42.55		3.42	Mostly sol	

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[2] Loss in weight on drying to constant weight at 105° C.

[3] These figures previously referred to by the authors, A. Jr. P. 84,5, 196 are given here for ready reference.

TABULATION OF ASSAYS.—*Continued.*

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash.	Sol. Ash. Dil. HCl	Remarks
		Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*		
Ginger Af.	10,761		6.27		5.48	3.92	Soluble	Vol. Ether Ext. 1.95%
Ginger Af. Pow.	9,827		6.40		5.95	4.63	Mostly sol.	
Ginger Af. Grd	10,047		5.04		5.45	4.41	Mostly sol.	
Ginger Af. Grd	10,113		5.10		5.50	4.50	Mostly sol.	
Ginger Jam. Bleached	10,760		4.80		2.95	4.04	Soluble	Vol. Ether Ext. 1.00%
Ginger Jam. Unbleached	10,759		4.15		3.10	3.35	Soluble	Vol. Ether Ext. 1.05%
Ginger Jam. Pow.	9,828		6.95		4.30	3.98	Soluble	
Ginger Jam. Pow.	10,036		3.94		3.50	3.26	Soluble	
Ginger Jam. Pow.	10,572		4.70		3.15	3.15	Soluble	
Ginger Jam. Grd	10,747		5.75		3.98	3.64	Soluble	
Glycyrrhiza Pow.	10,437			39.75		4.23	Soluble	
Glycyrrhiza Pow.	10,461			28.93		6.40	Soluble	
Glycyrrhiza Grd.	10,465			22.80		6.40	Soluble	
Glycyrrhiza Grd.	10,466			25.10		6.80	Soluble	
Grains Paradise	—		6.15		5.28	2.22	Mostly sol.	
Grains Paradise Pow.	10,062		6.28		5.46	3.18	Partly sol.	
Guaiac	9,478		87.50			4.58		
Guaiac	9,579		91.15			1.90		
Guaiac	9,652		80.00			3.00		
Guaiac Strained	9,701		95.60			1.13		
Guaiac Strained	10,002		96.73			0.75		
Guaiac	10,181		77.95			3.41	Mostly sol.	
Guaiac Pow.	9,325		88.10			3.66		
Guaiac Pow.	9,371		76.56			3.58		
Guaiac Pow.	9,372		92.64			1.63		
Guaiac Pow.	9,543		80.98			4.77		
Guaiac Pow.	9,580		87.65			2.99		
Guaiac Pow.	10,534		75.65			4.15		
Henna Lvs.	10,201					7.08	Pract. sol.	Contained 16.00% Foreign Lvs.

Henna Lvs.	10,238		13.84	28.33				Contained 19.01% Foreign Lvs.
Henna Lvs. Pow.	9,420					11.43		
Henna Lvs. Pow.	9,865					12.40	Mostly sol.	Dyeing test—not as deep color as blank
Henna Lvs. Pow.	10,005		24.14	31.68		9.30	Pract. sol.	Dyeing test—not as deep as blank
Insect Flow.	9,552		15.70		7.62	6.40		
Insect Flow.	9,553		16.25		8.08	6.40		
Insect Flow.	9,554		16.82		7.75	6.05		
Insect Flow.	9,555		14.98		8.28	7.05		
Insect Flow.	9,556		14.97		7.97	5.90		
Insect Flow.	10,364		16.20		7.80	6.60		
Insect Flow. Pow.	9,401	9.35	12.44		6.07	6.45		Pet. Ether Ext. 2.63%
Insect Flow. Pow.	9,402	9.34	16.85		7.04	9.21		Pet. Ether Ext. 2.98%
Insect Flow. Pow.	9,447		15.21		6.50	10.18	Partly insol.	
Insect Flow. Pow.	9,448		13.63		6.92	5.83	Mostly sol.	
Insect Flow. Pow.	9,622		17.78		8.00	7.66		
Insect Flow. Pow.	10,176		11.06		5.18	5.74	Soluble	Contained too few pollen grains
Insect Flow. Pow.	10,327		10.85		4.85	6.02		Contained too few pollen grains
Juniper Ber. Pow.	10,482		48.97			2.71	Soluble	
Kamala	9,387		70.94		63.25	5.02		
Kino	9,859	12.46	45.10			2.10	Mostly sol.	Tests of identity O. K.
Kino	9,944	11.64	62.66	43.75		1.60	Soluble	Tests of identity O. K.
Kino	9,990	12.01	79.40	67.90		1.47	Pract. sol.	Tests of identity O. K.
Krameria Grd.	7,394		32.88(49)					
Krameria Grd.	9,867		32.68(49)			2.25	Soluble	
Lactucarium	10,093	9.26		23.46		5.30		
Larkspur Seed			42.26		42.00	5.85	Pract. sol.	
Larkspur Seed Pow.	10,546		48.20		43.80	5.84	Pract. sol.	
Lobelia Herb	10,661		16.54			8.20	Soluble	Garbled = 11.73% stems 7.01% pods; 68.18% Broken Leaves

Tabulation of Assays.—*Continued.*

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. Dil.. HCl	Remarks
		Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*		
Lobelia Herb. Pow . . .	10,475		12.60			7.62	Mostly sol.	Microsc. cont. large amt. woody tissue
Mace.	10,858		31.00		26.85	1.36	Soluble	Vol. Ether Ext. 7.1%
Mace Pow.	9,965				26.00	2.35	Soluble	
Mastic Pow.	9,845		83.79		94.97			Test for rosin (odor when burned) negative
Matico Lvs			22.70(73)		12.23	13.90	Insol.	Vol. Ether Ext. 0.75%
Matico Lvs. Pow.	10,170		27.15(73)		13.43	13.80	Insol.	Vol. Ether Ext. 0.55%
Mustard Blk. Pow. . . .	10,103				37.16	4.50		
Mustard Blk. Grd.	10,456				37.03	4.22		
Mustard Yel. Grd.	10,454				33.85	4.85	Soluble	
Mustard Yel. Grd.	10,455				15.47	4.60	Soluble	
Myristica.	10,762		14.70		38.35	2.42	Soluble	Vol. Ether Ext. 2.85%
Myristica Pow.	9,978				39.85	1.96	Soluble	Pet. Ether Ext. 36.19%
Myristica Pow.					36.15	1.23	Soluble	Pet. Ether Ext. 34.6%
Myrrh.	10,639	9.02	21.35			8.20	Partly sol.	
Myrrh Pow.	10,056	7.03	40.58			8.39		
Nut Gall Pow.	10,021		76.96			1.41	Soluble	
Orange P. Bit.						3.70		
Orange P. Bit. Po.	9,954					4.25		
Orris Rt. Pow.	9,541				3.53	2.20		Vol. Ether Ext. 1.75%
Orris Rt. Pow.	9,851				3.85	1.75	Soluble	Vol. Ether Ext. 0.50%
Orris Rt. Pow.	10,115		9.25		3.18	1.72	Soluble	Vol. Ether Ext. 0.50%
Orris Rt. Pow.	10,368				3.75	1.60	Soluble	Vol. Ether Ext. 0.60%
Orris Rt. Pow.	10,635				4.22	1.75	Soluble	
Pepper Blk.		12.02	9.95	9.28	9.18	4.67	Insol.	
Pepper Blk. Pow.	10,038	7.70	10.80	10.82	9.10	4.03	Insol.	
Podophyllum Grd.	10,281		14.67		3.85	5.10	Partly sol.	Chlor. Ext. 2.98 %

Podophyllum Pow. . . .	10,436		10.30		4.15	4.2	Pract. sol.	Chlor. Ext. 3.51 %
Quassia Chips	10,490		6.01(33)			2.30	Soluble	
Quassia Pow.	10,440		5.40(33)			2.95	Soluble	
Resin Scammony	9,473	3.51	97.20		84.95	0.63		Chlor. Ext. 94.25%
Resin Scammony	9,661		95.44		65.42	0.05		Chlor. Ext. 70.55%
Resin Scammony	9,662		91.82		59.05	0.28		Chlor. Ext. 63.75%
Resin Scammony	9,901		95.50		63.25	0.45		Chlor. Ext. 75.65%
Resin Scammony	9,943	7.81	46.92		45.42	4.15		Chlor. Ext. 45.40% Cont. potato starch
Resin Scammony Pow.	9,603		93.33		70.03	0.17		Chlor. Ext. 81.80%
Resin Scammony Pow.	9,640		94.30		65.20	0.12		Chlor. Ext. 72.80%
Rhubarb Pow.	10,037		39.18(78)			9.16	Soluble	Alc. Ext.(49%)34.36%
Rhubarb Pow.	10,353		43.40(78)			6.95	Soluble	Alc. Ext.(49%)43.05%
Rhubarb Grd	10,255		40.70(78)			6.70	Soluble	Alc. Ext.(49%)43.40%
Sabadilla Seed	A		27.50		22.79	3.28	Soluble	
Sabadilla Seed	B		26.50		20.05	6.92	Soluble	
Sabadilla Seed Pow. . .	9,423					7.35		
Sabadilla Seed Pow. . .	9,686					6.00		
Sabadilla Seed Pow. . .	9,792					14.80	Pract. insol.	
Sabadilla Seed Pow. . .	9,966					10.05	Pract. insol	
Sabadilla Seed Pow. . .	10,165		33.13		24.40	7.45	Mostly insol.	
Sabadilla Seed Pow. . .	10,480		33.17		21.60	11.15		
Sabadilla Seed Pow. . .	10,289		34.58		24.45	10.10	Mostly insol.	
Sabadilla Seed Pow. . .	10,421		34.15		23.86	10.22	Mostly insol.	
Sabadilla Seed Pow. . .	10,769		24.74		18.93	10.13		
Saffron	10,058							Garbled, styles 17.8% Stamens 2.02%
Saffron	10,094	10.50				4.90	Soluble	Garbled, styles 7.5% Stamens .65%
Saffron	10,304	11.26				4.59	Soluble	Garbled, styles 6.8% Stamens 1.20%
Saffron	10,492	13.08				4.85		Garbled, styles 8.9% Stamens 2.03%
Sage Grd	9,850		11.63			8.05	Pract. sol.	
Sage Pow.	10,077	14.56				8.72	Soluble	
Santonica			19.96		12.76	11.30	Mostly sol.	
Santonica Pow.	10,039		26.16		14.89	9.03	Mostly sol.	

TABULATION OF ASSAYS.—*Continued.*

Sample	Sample No.	Moist.	Alc. Ext.	Water Ext.	Ether Ext.	Ash	Sol. Ash. Dil. HCl	Remarks
		Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*		
Sarsaparilla Hon......	10,510	7.00	10.60(33)			10.27		Appear. fine (no dirt, stems or rhiz)
Sarsaparilla Hon. Pow.	10,441		18.87(33)			8.20	Mostly insol.	
Sarsaparilla Mex......	10,509	7.08	15.90(33)			15.04		Appear. poor: cont. 18.74% stems and rhiz. dirt 32.35%
Sarsaparilla Mex. Pow.	10,442		14.50(33)			32.45	Insol.	
Saw Palmetta Grd....	10,284		42.25		10.50	1.65	Pract. sol.	
Senna Alex......	9,461					8.42	Pract. insol.	
Senna Alex...........	9,628			41.83				
Senna Alex...........	10,397			52.10				
Senna Alex...........	10,522			32.84				
Senna India.	9,462					8.52	Soluble	
Senna Alex. Cut......	9,388					11.93	Partly sol.	
Senna Alex. Grd......	9,392					13.44	Mostly insol.	
Senna Alex. Pow.	9,390			27.80		21.00	Mostly insol.	
Senna Alex. Pow.	9,767			29.31		16.53		
Senna Alex. Pow.	9,916			31.95		8.65	Pract. sol.	
Senna Alex. Pow.	10,633			36.25		9.00	Soluble	
Senna India Grd......	9,391					9.73	Pract. sol.	
Senna India Grd......	10,654		32.25(49)	29.6		8.75	Pract. sol.	
Senna India Pow.	9,594			29.43		8.77	Pract. sol.	
Senna India Pow.	10,169					9.01	Pract. sol.	
Shellac Pow.	10,571		91.10			1.39		
Simaruba Bk. Pow. ..	10,472					2.22	Soluble	
Sloe Berries Cut......	10,783		30.3	39.50	4.95	2.91	Soluble	
Soap Bk. Pow.	10,478					11.57	Pract. sol.	
Starch Corn..........	10,352	9.38				0.05		
Starch Maranta......	10 402					0.27		
Valerian Rt..........	9,314	15.05	34.38(49)					Ext. calcul. to dry basis 40.48%

The sample of powder, No. 9395, contained aleurone grains and stone cells from the seed and stone cells characteristic elements of the peel. Sample of powder No. 9511 contained practically no aleurone grains, but contained the characteristic stone cells of the rind.

Guaiac.—The determination of the acid number is very unsatisfactory, owing to the color of the solution.

Hellebore, White.—Five samples assayed by the method given below yielded 1.027, 0.641, 0.995, 1.445, and 0.916 per cent. total alkaloids, respectively. *Method.* Transfer 15 gms. of the sample in fine powder to an eight ounce bottle, add 150 Cc. chloroform ether mixture (4 and 1) and shake for 10 minutes. Add 5 Cc. ammonia water, 10 per cent., and shake in mechanical shaker for 4 hours. Filter through cotton and collect 100 Cc. Transfer to separatory funnel and extract with normal sulphuric acid. Wash the acid solution with chloroform and reject the chloroform. Add ammonia water in excess and extract with chloroform. Evaporate the chloroform solution in a tared beaker or flask, dry, and weigh. Weight equals total alkaloids in 10 gm. of the sample.

Henna Leaves.—Dyeing test—boil 2 gm. sample in 100 gm. water for 10 minutes, cool and make up loss of water. Filter and to 30 Cc. of the filtrate add 2 Cc. dilute sulphuric acid, immerse in the solution a strip of white flannel weighing about 0.5 gm. and boil for 10 minutes. Rinse flannel, and then "strip" in 50 Cc. water containing 4 Cc. ammonia water, boiling 10 minutes. Rinse and dry flannel and mark No. 1. Add 2 Cc. dilute sulphuric acid to the ammoniacal solution and another strip of white flannel weighing about 0.5 gm. and boil for 10 minutes. Rinse and dry flannel and mark No. 2. Compare sample with a selected sample of leaves.

Kino.—Tests of identity; ferric chloride T. S. added to an aqueous solution produces a gray black precipitate. Lead acetate T. S. added to an aqueous solution produces a gray purplish precipitate. Tartar emetic added to an aqueous solution produces a light brown precipitate.

Lycopodium.—Ten samples contained ash as follows: 1.42, 1.10, 3.35 (contained sand); 1.23, 1.28, 1.55, 1.30, 1.39, and 2.60 per cent. (contained sand).

Analytical Department,
SCHIEFFELIN & CO., New York.
August 10, 1912.

THE ALKALOIDAL CONTENT OF INDIVIDUAL PLANTS OF DATURA STRAMONIUM L. AND DATURA TATULA L.*

By F. A. Miller and J. W. Meader.

The examination of individual plants of *Datura Stramonium L.* and *Datura Tatula L.* for their total alkaloidal content has been undertaken for two reasons: first, as a means of following the effects of prolonged cultivation upon the percentage of alkaloids, and, second, as a means of selecting high yielding individual plants. These high yielding plants are intended to serve as parents of future generations from which continued selections can be made. In these selections the object is to develop pure strains which, it is hoped, will exhibit a racial improvement in relative alkaloidal value over wild plants or those cultivated without any effort toward improvement. It has been shown [1] that the application of certain nitrogenous fertilizers to members of the Solonaceous family, and especially belladonna, will cause a perceptible increase in the alkaloidal content. This increase, however, does not represent an improvement as understood by plant breeders. It is environmental and thus only temporary. What is most needed to further the advancement of drug growing is a permanent improvement of the more valuable medicinal plants. This may be accomplished through the application of special methods of breeding as now practised by plant breeders, horticulturists, and florists.

Little has been done on the cultivation and improvement of stramonium except in the case of a few species, which are grown for decorative purposes. Experimental plots of several species have been grown but apparently have not been continuously cultivated. As to improvement, there is no evidence of any attempts having been made, except that by Meyer [2] to hybridize *Datura Metel L.* and *Datura Stramonium L.*

Members of the genus other than Datura Stramonium L. have been reported upon favorably and may be found through further investigation to be equally valuable. *Datura Metel L.* has been shown by Schmidt [3] and [4] to contain as much hyoscyamin as *Datura Stramonium L.*, also that *Datura alba Nees*, which is grown in

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* Presented to Section VIII B, Eighth International Congress of Applied Chemistry.

China, India, and southern Europe for decorative purposes, contains hyoscyamin and some atropin in the seed. Hesse[5] also found considerable amounts of alkaloid in this species. Peinemann[6] is quoted as having found more alkaloid in the leaf, seed, and root of this species than in the corresponding parts of *Datura Stramonium L.* Kircher[7] examined *Datura Metel L., Datura quercifolia* and *Datura arborea L.,* finding in the leaves and seeds of quercifolia an average of 0.418 per cent. and 0.292 per cent. of alkaloids respectively. He also noted the presence of alkaloids in *Datura Metel L.* and *Datura arborea L.*

The desirability of cultivating and improving *Datura Stramonium L.* is indicated by an examination of commercial conditions. These conditions, as enumerated below, indicate a wide range of variations in percentage of alkaloids from year to year and from different geographical sources. Feldhaus,[8] in the examination of twenty-five commercial samples from various sources, notes a variation of from 0.211 per cent. to 0.495 per cent., with an average of 0.328 per cent. In 1901 he found an average of 0.476 per cent., while in 1902 the average was only 0.337 per cent. Farr and Wright[9] state that in 1906 they found a maximum of 0.30 per cent. and a minimum of 0.12 per cent., average 0.22 per cent. They quote Kordeas as having found 0.20 per cent. and Umney 0.39 per cent. to 0.41 per cent. Smith, Kline and French Co.[10] in 1908 report on sixteen assays which indicate a range of from 0.25 per cent. to 0.37 per cent., nine of these being below the United States Pharmacopœial standard. In 1911[11] they again report on fifteen assays ranging from 0.22 per cent. to 0.35 per cent., three of these being below the standard, seven not exceeding 0.28 per cent., and five running above 0.30 per cent. Vanderkleed[12] in 1907 reported on nineteen assays ranging from 0.15 per cent. to 0.62 per cent. Again in 1908[13] he considers twenty-five samples of which the lowest was 0.13 per cent., highest 0.51 per cent., average 0.34 per cent. Twenty-one of these were above and four below the official standard. Hankey[14] examined lots which ran as low as 0.14 per cent., with an average of only 0.25 per cent. for the best. Puckner[15] gives a variation of from 0.13 per cent. to 0.45 per cent., as found in sixteen samples. Average results from the Lilly laboratories for the past five years indicate an annual variation and a recent annual decrease in alkaloidal content: 1907, 0.34 per cent.; 1908, 0.40 per cent.; 1909, 0.38 per cent.; 1910, 0.32 per cent., 1911, 0.25 per cent. The foregoing data indicates the desirability of a *uniform high yielding* plant.

The objects of the present investigation have already been stated. The species used were *Datura Stramonium L.* and *Datura Tatula L.*, both common in this country. The plants of *Datura Stramonium L.* were grown from seed purchased in the London market. This seed was not absolutely pure, as one *Datura Tatula L.* plant appeared in the experimental plot from the first planting. The *Datura Tatula L.* plants used in the experiment were transplanted from a vacant lot in Indianapolis. The two forms were grown under the same conditions on soil consisting of stiff clay loam. Cultivation was frequent and continued until mature seed could be obtained.

The samples of leaves for assay from the *Datura Tatula L.* plants were collected August 17, 1910. At this time the plants bore mature but unripe seed pods, open flowers and numerous buds. August 30th, the plot of Datura Stramonium had reached a corresponding stage of maturity and samples were collected on this date. In both cases, individual plants of vigorous growth were selected and numbered. The samples as removed from these individuals were given the corresponding number of the plant and retained separately. Later, mature seeds were collected from the same plants. The number of leaves removed was in no instance so great as to interfere with normal growth.

The samples were thoroughly cured at room temperature and stored in paper bags until one year later, when they were assayed. The individual plants assayed as follows:

No. B-979	Datura Stramonium L.	0.47 per cent.
No. B-980	Datura Stramonium L.	0.55 per cent.
No. B-981	Datura Stramonium L.	0.52 per cent.
No. B-982	Datura Stramonium L.	0.46 per cent.
No. B-983	Datura Tatula L.	0.63 per cent.
No. B-984	Datura Tatula L.	0.65 per cent.
No. B-985	Datura Tatula L.	0.47 per cent.

The process of the United States Pharmacopœia for the assay of stramonium was used, taking liberal amounts of solvent in all cases, and with the exception that N/20 hydrochloric acid was substituted for N/10 sulphuric acid in titrating.

It will be noted from the foregoing figures that there is a marked variation in the total alkaloidal percentage of individual plants. Attention has been called to the variation in commercial stramonium for different years and for different geographical sources. Little is known, however, upon the behavior of the percentage of alkaloids in individual plants. True[16] has found that individual belladonna plants vary from 0.2 per cent. to 0.7 per cent. in total alkaloids. The extremes as found for *D. Stramonium L.* are maximum 0.55 per cent., minimum 0.4 per cent., and *D. Tatula L.*, maximum 0.65 per cent., minimum 0.47 per cent.

Datura Tatula L., a species very closely related botanically to the official *Datura Stramonium L.*, indicates a much higher alkaloidal percentage than the U. S. Pharmacopœial species. Both forms considered, likewise show a higher percentage than any commercial drug examined during the past five years. The maximum for this period at the Lilly laboratories being 0.40 per cent., minimum 0.25 per cent., and average 0.33 per cent. The results obtained also demonstrate that continuous cultivation does not interfere with the natural formation of a high percentage of alkaloids.

The investigation of individual plants from this group is to be continued upon the same plan. Seeds were collected from the plants assayed, and those from the highest and lowest yielding plants will be planted and individuals again tested. In one case the object is to bring about an increase in the percentage of alkaloids, while in the other it is to decrease this percentage.

BIBLIOGRAPHY.

[1] Chevalier: Comptes Rendus, 1910, 150, 344.
[2] Meyer: Arch. der Pharm., 1905, 243, 304.
[3] Schmidt: Arch. der Pharm., 1905, 243, 303.
[4] Schmidt: Arch. der Pharm., 1910, 248, 641.
[5] Hesse: Pharm. Jr., 1900, 64, 250.
[6] Peinemann: Handelsbericht von Gehe & Co., 1896.
[7] Kircher: Arch. der Pharm., 1905, 243, 309.
[8] Feldhaus: Arch. der Pharm., 1905, 243, 328.
[9] Farr & Wright: Pharm. Jr., 1906, 76, 310.
[10] Smith, Kline & French Co.: Anal. Rept., 1908, 36.
[11] Smith, Kline & French Co.: Anal. Rept., 1911, 42.
[12] Vanderkleed: Proc. Penn. Pharm. Assoc'n, 1907, 90.
[13] Vanderkleed: Proc. Penn. Pharm. Assoc'n, 1908, 88.
[14] Hankey: Am. Drug., 1907, 50, 9.
[15] Puckner: Proc. Am. Pharm. Assoc'n, 1906, 440.
[16] True: Oil, Paint and Drug Reporter, 1911, 80, 29.

From the Departments of Botany and Analytical Chemistry.
Eli Lilly & Company,
Indianapolis, Ind.
June, 1912.

PROGRESS OF THE REVISION OF THE UNITED STATES PHARMACOPŒIA.[1]

By Joseph P. Remington, Ph.M.

It will doubtless be of interest to the members of the American Pharmaceutical Association to be informed on the present state of the work of the Committee of Revision.

It will be remembered that an Executive Committee of fifteen, chosen by the votes of the General Committee of fifty-one, have immediate charge of the work of revision. The work was divided into fifteen parts, and a member of the Executive Committee was chosen as the chairman of each sub-committee. The members of the sub-committees were selected for their special knowledge of the subjects treated by each sub-committee, and several members are members of several sub-committees. In each case the member was consulted before his appointment, as it was particularly desirable that each member should contribute his share of work to the general fund.

Like every constructive work of this character, which is voluntary, some members have borne a greater share of the work than others. Some are very willing to assume, at the outset, obligations which they cannot fulfill and events proved that the chairmen of the sub-committees have had to proceed without their help. This has thrown a large amount of work upon the chairmen who have had to send in their reports to the Executive Committee after the continuous urging of the general chairman to keep going.

Admissions and Deletions.

Experience has again demonstrated the value of the plan, which was first used in the last revision of the Pharmacopœia, of culling out the subjects which require little or no revision and starting work upon them. This was particularly the case with the report on admissions and deletions. A preliminary list was sent out for which it was believed a majority of the sub-committee would certainly vote for admission, leaving debatable subjects for later consideration. This enabled the chairman of the Executive Committee to begin the work and give a number of subjects to each sub-committee for a start. From time to time the chairman of the sub-committee on Scope reported lists of other subjects which had obtained a majority of votes for admission and at the last meeting of this Association in Boston the tentative list was submitted, and, with very few exceptions, has received the general approval of those interested in the Pharmacopœia. Some of the physicians on the General Committee have vigorously objected to the admission of some of the drugs and preparations found in this list, for it must be understood that a small but active number of physicians believed that only a very limited number of drugs and preparations should be admitted to the Pharmacopœia. A larger number of the members of the committee desired the admission of drugs and preparations that are used to a large extent in any section of the country.

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[1] By special vote of the Council of the American Pharmaceutical Association this report was released from the usual rule with regard to advance publication.—Editor.

In the writer's opinion, entirely too much stress has been laid upon this part of the work. Physicians will continue to prescribe unofficial substances as they always have; some even pride themselves upon the fact that they have no use for the Pharmacopœia, and that they do not use such common things as do the general run of practitioners. But the committee have not accepted the view of a skeleton Pharmacopœia, nor have they approved of a padded one.

While upon this subject, it should be stated that the list has not yet been closed and it is proposed to make a few more additions and deletions.

Patented Products, Synthetics, Etc.

The subject of admitting controlled products, patented, copyrighted, or otherwise monopolized, has been made a subject of debate. This question has always proved a stumbling-block in previous revisions, and the question is more important to-day because of the immense number of such products now in general use. Manufacturers and their agents have been very active in insisting upon their legal rights in protecting their property. Physicians have been luke-warm and the majority insist on prescribing anything which they believe will aid their patients to recover health.

The great difficulty is the practical one of introducing into the Pharmacopœia any substance over which there can be no control of identity and purity. The Pharmacopœia might introduce a controlled product under its name or a new name, but of what use would be the official tests? The manufacturer could at will alter his product in some way, by changing its color or in some other unimportant particular. The National and State Food and Drug Acts would, of course, recognize the official preparation, but it could not be had in the market and it would be taking up valuable space. The manufacturers almost to a unit declare that they do not care whether the Pharmacopœia admits their products or not. Naturally they do not care to have any authorized supervision over their property, and, so long as their sales are not interfered with, they do not want to be hampered in any way.

Our courts have recognized proprietary rights in medicines, and the introduction of controlled products would amount to an advertisement showing that such and such a product had found favor in the sight of the Committee of Revision. The complications would be endless. There would probably be two kinds of the same preparation on the market—the manufacturers' and the official. A physician prescribing such a preparation might have the manufacturers' product in mind; the pharmacist might have in stock only the official.

In cases where the patent has run out on certain largely used synthetics, phenacetin, for instance, the difficulty has been met by introducing the substance under a different name, but many of the largely used synthetics are sold under patents which are still alive. It would seem that the only solution would be to have an agreement with the manufacturer, firm, or corporation controlling the product, but this would be of doubtful utility and would only obtain in a very few cases. The manufacturer would not care to imperil any of his right to exclusive manufacture. Where a patent will run out within a year or a comparatively short time, he might be willing, for the sake of the advertisement and to increase his sales somewhat, particularly in view of a competing preparation which was supplanting the older product.

Nomenclature.

The subject of nomenclature has been settled by the Executive Committee on the following basis:

"That changes in the titles of articles at present official be made only for the purpose of insuring greater accuracy, brevity or safety in dispensing, and that in the case of newly admitted articles titles be chosen which are in harmony with general usage and convenient for prescribing, the scientific name being given at least as a synonym in the case of chemicals of a definite composition.

"That in stating the strength of acids in the U. S. P. they be stated in such terms as Hydrogen Chloride, HCl, 'absolute hydrochoric acid;' Hydrogen Phosphate, H_3PO_4, 'absolute orthophosphoric acid;' Hydrogen Acetate, CH_3COOH, 'absolute acetic acid,' etc."

It is not likely that there will be any serious objection to continuing the present style of latinization so that it would affect the labels at present in use throughout the country. The experience of 1906 and 1907 of manufacturers, wholesale druggists, retail druggists, and physicians when the Food and Drugs Act went into effect is one long to be remembered. Many thousands of dollars worth of labels had to be destroyed and the labor, confusion, and loss of money was very great. But it was worth the trouble and the label to-day has vastly more significance than ever before.

Synonyms.

The subject of synonyms has correspondingly increased in importance. Some druggists seek to evade the official requirements by avoiding an official title and they use a name which will permit the sale of the substance without incurring much risk. It is difficult to see how the Pharmacopœia can cover the field thoroughly, because like when exterminating rats, if one hole is stopped another is sure to be opened in a new place. There is no question, however, that the list of synonyms in the Pharmacopœia will have to be increased.

Physical Factors.

The question of stating solubilities of substances in the Pharmacopœia has occupied much attention. Of course it would be most desirable to give an exact figure for the solubility of a substance in water, boiling water, alcohol, diluted alcohol, glycerin, ether, chloroform, petroleum benzin, fixed oils, and other solvents. It would also be desirable to introduce a uniform method of taking solubilities. There are physical difficulties, however, which would lead to false figures and the methods of the physical laboratory, which are most accurate, would be entirely unsuited for the use of the pharmacist and physician. For a book like the Pharmacopœia the latter rarely require a method which necessitates a thermostat or a continuous agitation apparatus or a method which requires a long time to determine the exact solubility. But the principal reason for making an exception and not inserting a uniform method for solubilities is that solubilities alone are inconclusive tests for identity or purity. They are useful physical factors within certain ranges, but in view of the abuses which might arise, particularly in legal contests, where solubilities are stated with decimal figures and because it would be possible to involve honest manufacturers, retail druggists and others in needless criticism and often unjust accusation, it has been deemed best to state solubilities in rounded figures or by giving a range. It is not proposed to drop the use of figures in stating solubilities, but a statement will be inserted in the Introductory Notices of the Pharmacopœia giving the reasons for not regarding solubilities as conclusive tests. This question is, however, open for further consideration.

Melting points, boiling points, and specific gravities do not fall within this category, and uniform methods for obtaining these physical factors will doubtless be inserted.

Standard Temperature.

The Executive Committee and General Committee of Revision have voted to retain 25° C. (77° F.) as the standard temperature for specific gravities and other purposes. A table will likely be inserted in the Appendix giving corresponding values at 15° and 20° C. for official specific gravities.

The work on the Inorganic and Organic Chemicals is nearly completed and this occupies the largest number of pages in the book.

Pharmacognosy and Botany is well advanced. The reports on Galenical Preparations are well in hand. There still remain the editing and the preparing of the final manuscript. This, of course, cannot be done until all of the reports have been passed upon. When this work is completed, printing will begin and publicity will be given to whatever changes have been made in tests and standards.

The following table shows the number of pages of official Bulletins, Letters, and Circulars issued by the various sub-committees and committees, although the communications from firms, corporations, physicians, pharmacists, scientific bodies, and the public generally, and the replies thereto are not included in the summary, although they constitute a large amount of correspondence.

SUB-COMMITTEE BULLETINS.

No. 1.	Scope	288
No. 2.	Therapeutics, etc.	156
No. 3.	Biological Products, etc	80
No. 4.	Botany and Pharmacognosy	252
No. 5.	Inorganic Chemistry	430
No. 6.	Organic Chemistry	797
No. 7.	Proximate Assays	270
No. 8.	Volatile Oils	89
No. 9.	Fluid and Solid Extracts	218
No. 10.	Waters and Spirits	175
No. 11.	Syrups and Elixirs	253
No. 12.	Cerates and Ointments	49
No. 13.	Miscellaneous Galenicals	121
No. 14.	Tables, Weights, etc	75
No. 15.	Nomenclature	...
	Executive Committee Letters	1311
	General Committee Circulars	596
	Total	5160

The text has been reported to the Executive Committee for 500 articles to this date.

THE CLASSIFICATION OF CARBON COMPOUNDS.[1]

BY MARSTON TAYLOR BOGERT.

(Continued from p. 413)

In 1836, Laurent advanced his nucleus theory which, although never generally accepted, was used by Gmelin in his "Handbook," with certain alterations, as a foundation for a classification of organic compounds. According to this theory, every organic compound contains a group of atoms termed a "nucleus" or "germ." Primary nuclei consist of carbon and hydrogen, and in these the hydrogen may be replaced by other elements or groups of elements, thus giving rise to derived or secondary nuclei, analogous in composition and chemical properties to the primary nuclei. Other atoms may be attached to this nucleus, or they may quite surround it, and when these are removed the primary nucleus reappears.

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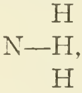
[1] Reprinted from *Proc. Amer. Philos. Soc.*, July, 1912, pp. 252–268.

In 1839, Dumas developed his substitution theory to a theory of chemical types. An advance was made in the replacement of the dualistic formulas by unitary ones.

Gerhardt's residue theory appeared at about this time. It may well be explained in comparison with the older radical theory. According to the latter, ethyl nitrate, for example, was regarded as the nitrate of ethyl oxide $(C_2H_5)_2O.N_2O_5$; while, according to Gerhardt, the combination of the nitric acid and alcohol occurs in such a manner that one compound gives up a hydrogen and the other a hydroxyl, forming water, the two "residues" then uniting to ethyl nitrate.

The discovery of the compound ammonias by Wurtz (1849) and Hofmann led to the arrangement of organic compounds on types of various simple inorganic bodies. For example, it was assumed that the hydrogen in ammonia not only could be replaced atom for atom by other elements, but also by compound radicals.

Gerhardt's type theory was really a combination of his residue theory with the older radical theory. His four fundamental types were hydrogen, hydrochloric acid, water and ammonia; H—H, H—Cl, H—O—H,  $\begin{array}{l} H \\ N—H \\ H \end{array}$, to which Kekulé subsequently added methane, CH_4. These proving insufficient, multiple and mixed types were invented.

So early as 1838, Gerhardt had called attention to the fact that by the action of sulphuric acid upon various substances compounds were produced in which the characteristic properties of the constituents were not present. To distinguish such, he coined the term "copulated compounds." His original views were considerably enlarged and modified by Berzelius. According to this point of view, many radicals were assumed to be composed of several simpler ones. Thus, the fact that many monobasic acids (written on the water type) could frequently be decomposed with liberation of the CO group as CO_2, together with the alcohol radical, caused the acid radicals to be looked upon as made up of CO and an alcohol radical, $CH_3.CO—O—H$, instead of $C_2H_3O—O—H$, and paved the way for the modern structural formulas.

It was Williamson who showed that the existence of compound radicals could be assumed just as well for inorganic as for organic compounds, and that organic chemistry could no longer be correctly designated as "the chemistry of the compound radicals."

With the discovery of substances common to both plants and animals, the subdivision of organic chemistry into vegetable and animal chemistry was quite generally abandoned.

Gmelin says in his "Handbook" (Vol. VII., pp. 4 and 5):

> "Carbon is the only element which is essential to organic compounds; every one of the other elements may be absent from particular compounds, but no compound which in all its relations deserves the name "organic" is destitute of carbon. . . . If we were to regard as organic those carbon compounds which have been classed hitherto among inorganic substances, namely carbonic oxide, carbonic acid, sulfide of carbon, phosgene, cast iron, etc., we might define organic compounds simply as 'the compounds of carbon'; but organic compounds are still further distinguished by containing more than one atom of carbon. . . . Hence the term 'organic compounds' includes all primary compounds containing more than one atom of carbon."

This last qualification was unfortunate, for it was soon shown that the atomic weight of carbon was 12, instead of 6, and that, therefore, methyl alcohol and formic acid contained only one atom of carbon and would be excluded from organic compounds by the above definition.

Kane, several years before (about 1840), had exposed himself to no such difficulty. In his "Elements of Chemistry" he discussed all organic compounds as carbon derivatives and prefaced this chapter with the following remarks:

> "The element which is peculiarly organic and which, with the one exception of ammonia, exists in all bodies derived from an animal or vegetable source, is carbon. It is hence that I have deferred the description of carbon and its compounds until I could pass directly from it to the great variety of organic bodies of which it is the basis. With the constituents of inorganic bodies it has but an accidental connection; for, as I shall hereafter show, there is no form of carbon which has not at some time made part of an organized being."

In the great "Handwörterbuch" of Liebig, Poggendorff and Wöhler (1851), we find the following:

> "Since, however, a natural boundary between organic and inorganic compounds in general does not exist, and can no longer be assumed, since we know that both are subject to the same combining laws, and since, therefore, if a separation is desired, an artificial and arbitrary boundary line must be drawn, it appears simplest to designate organic chemistry directly as 'the chemistry of the carbon compounds,' and only a few, namely the simplest

carbon compounds—CO_2, CO, $COCl_2$, CS_2 and carbamic acid—are more conveniently referred to inorganic chemistry."

Kekulé later (1866) expressed himself in similar vein. He says·

"We must come to the conclusion that the chemical compounds of the vegetable and animal kingdoms contain the same elements as those of inanimate nature. We know that in both cases the same laws of combination hold good, and hence that no differences exist between organic and inorganic compounds either in their component materials, in the forces which hold these materials together, or in the number or mode of grouping of their atoms. . . . If, however, for the sake of perspicuity, a line of demarcation is to be drawn, we must remember that this boundary is an empirical rather than a natural one and may be traced at any point which seems most desirable. If we wish to express by 'organic chemistry' that which is usually considered under the name, we shall do best to include all carbon compounds. We, therefore, define organic chemistry as 'the chemistry of the carbon compounds,' and we do not set up any opposition between inorganic and organic bodies. That to which the old name of organic chemistry has been given, and which we express by the more distinctive term of the chemistry of the carbon compounds, is merely a special portion of pure chemistry, considered apart from the other portion only because the large number and the peculiar importance of the carbon compounds renders their special consideration necessary."

This change in the significance of the term "organic" chemistry marks the passing of the old Vitalistic doctrine, and before we lose sight of it altogether, it may not be amiss to quote some interesting passages from Meldola's recent work on the "Chemical Synthesis of Vital Products." He says, among other things, that while it is quite true that we can produce in the laboratory substances identical with those formed in the living organism, in the majority of cases we cannot maintain that the syntheses are identical in their mechanism, and those who would "explain" the biochemical processes by a simple chemical equation should bear in mind the fact that "the sign connecting the two sides of the equation stands for the whole unexplored region of biochemical transmutations." We lack exact knowledge of the nature of the synthetic processes going on in the living organism, and there is little reason for believing that they have much analogy with our laboratory methods. In fact, we cannot duplicate in the laboratory the most fundamental of all these syntheses—the photosynthesis accomplished by plants, in which carbon dioxide is absorbed by an organic compound and the product decomposed with liberation of oxygen. While the author does not at all array himself on the side of the vitalists, he concludes, from the summary of experimental results recorded in his book,

> "that the testimony of pure chemistry cannot, as it stands at present (*i. e.*, about 1904), be legitimately interpreted into a direct negation of Vitalism in any form. This negation may, and probably will be made possible in the future, when our chemical methods have been made to approximate more closely to the vital methods."

Until about the year 1830, it was supposed that the same element could present itself in only one form, endowed with one invariable set of properties, and that from the combination of the same elements in the same proportions, only one and the same substance could possibly result. The discovery of isomeric compounds, consequently, led to a more careful search for the cause of the difference in the properties of substances with the same percentage composition. With the establishment of the correct relations of atom, molecule and equivalent, the way was opened for the valence hypothesis, and in 1858 Kekulé said:

> "I do not regard it as the chief aim of our time to detect atomic groups which, owing to certain properties, may be considered radicals, and thus to include the compounds under certain types, which in this way have scarcely any other significance than that of type or example formulas. I am rather of the opinion that the generalization should be extended to the constitution of the radicals themselves, to the determination of the relation of the elements among themselves, and thus to deduce from the nature of the elements both the nature of the radicals and that of their compounds."

The recognition of the quadrivalence of carbon atoms and their power of uniting with each other, accounted for the existence and combining value of radicals, as well as for their constitution. The type theory therefore found a broader generalization and amplification in the extension of the valence hypothesis of Kekulé and Couper to the derivatives of carbon.

While in years gone by, as has been said, the classification of carbon compounds was mainly or exclusively according to the source from which they were obtained, in modern times the classification has been based solely upon their structural relations and entirely independent of their origin.

One of the first to adopt this method of classification was Löwig, in 1840. Gmelin, in 1848, arranged carbon compounds in his "Handbook" according to the number of carbon atoms they contained, and subdivided them on lines similar to those suggested in Laurent's nucleus theory, as already mentioned.

Schiel, in 1842, remarked upon the fact that alcohol radicals form a simple and regularly graded series of bodies, of which the properties as well as the composition exhibit corresponding regular gradations, and he predicted the existence of other similar series. Shortly afterward, Dumas pointed out that the fatty acids constitute such a series. Gerhardt, in his "Précis de Chimie Organique" (1844), collected a large number of such groups, gave to them the name "homologous series," and distributed them under the general divisions suggested by his type theory. This recognition of homologous series as the units in classifying organic compounds was a great step in advance, simplified the classification enormously, and was very fruitful in stimulating investigation to discover other similar series.

The terms "fatty" and "aromatic" chemistry appeared about 1858. At first used in more restricted sense, they were gradually extended until the former covered all acyclic compounds and the latter nearly all cyclic. This subdivision of organic chemistry has been generally adopted (with few exceptions) ever since. More recently, it has been found advisable, particularly in the larger textbooks, to split up aromatic chemistry into carbocyclic and heterocyclic. So that we now have the three classes, fatty (or alipathic), carbocyclic (or isocarbocyclic), and heterocyclic. And yet this classification is no longer satisfactory, for there is no sharp dividing line between straight-chain and cyclic compounds, the one merging gradually into the other. Certain cyclic structures (as the ethylene oxides, lactones, lactames, imides, etc.) are invariably discussed under fatty chemistry, and certain straight-chain compounds (like the olefin terpenes and their derivatives) are generally taken up under aromatic chemistry, while the alicyclic compounds, as their name indicates, form the natural transition from alipathic to cyclic structures.

With the filling in of the gaps heretofore existing between alipathic and aromatic chemistry, the time seems appropriate for a change in our classification of carbon compounds which shall recognize the essential unity of the subject, and no longer give the impression that organic chemistry is composed of three varieties of chemistry—fatty, carbocyclic and heterocyclic.

The method which appeals particularly to the writer, and which he has followed with his classes at Columbia University for the past ten years, is to begin with the hydrocarbons, as the simplest carbon compounds, and discuss in succession the various series of hydrocarbons, saturated and unsaturated, acyclic and cyclic, before passing on to the next group. After a careful consideration of these fundamentally important compounds, other classes of carbon compounds are taken up in similar manner; all of the simple halogen derivatives being considered together, all the nitro bodies, all the alcohols, and so on. All other classes are very conveniently regarded as derivatives of the hydrocarbons. With a knowledge of the properties of the various series of hydrocarbons, the study of their derivatives then resolves itself chiefly into the following questions: (1) What are the characteristic properties of the group under consideration (be it halogen, amino, carboxyl, or any other group)? (2) In what manner are its properties influenced by the hydrocarbon nucleus to which it is attached, and by the other groups present? (3) How are the properties of the entire molecule likely to be affected by the introduction of such an element or group? To take a single case, by way of illustration, the simple hydroxyl derivatives of the hydrocarbons are numerous and important, and certain well defined characteristics cling to the hydroxyl group irrespective of the particular hydrocarbon nucleus to which it is attached. Thus, its hydrogen may be replaced by metals (giving alcoholates or phenolates), by hydrocarbon radicles (giving ethers), by acid radicals (giving esters), or the entire hydroxyl may be replaced by a halogen by acting upon it with a phosphorus halide. That the behavior of this hydroxyl group is influenced, however, by the hydrocarbon nucleus to which it is attached, can be seen at once by comparing a phenol with an alcohol. Further, the presence of the hydroxyl group alters the properties of the entire molecule, as appears immediately when we compare the behavior of benzene and of phenol towards bromine, nitric acid, oxidizing agents, and so forth.

In this way, the characteristic properties of the different substituents may be firmly fixed in the mind, as well as the general nature of the various classes of organic compounds, and the student learns to associate certain chemical reactions with certain chemical structures, and to reason intelligently from a given structural formula as to the chemical behavior of the substance, whether he ever heard of the compound before or not, thus learning not only to reduce correct constitutional formulas, but also a grasp at a glance the chemical properties summarized by such formulas.

This method of classification saves an immense amount of repetition and brings home very clearly the fundamental properties and relationships of organic compounds, as well as the application of these properties in analytical and industrial chemistry. Another advantage which follows from this arrangement, is the manner in which it lends itself to laboratory illustration. As all compounds containing the same substituting element or group are discussed together, examples for laboratory practice may be drawn from either the acyclic or the cyclic field.

The author claims no originality for this suggested classification, except so far as certain details are concerned, for it was recommended and adopted so long ago as 1864 by that distinguished Russian chemist, Butlerow, in his "Lehrbuch der organischen Chemie," and has won adherents in this country in Professors W. A. Noyes, Kremers, and possibly others. My reasons for presenting it at the present time are the evident need for some change in our present system, brought into the foreground by the approaching publication of the new edition of Beilstein's monumental "Handbuch der organischen Chemie" and the creation of national commissions on the nomenclature of organic compounds, and my firm belief, as the result of experience, that the adoption of such a system will aid in inspiring and stimulating greater interest in the study of organic chemistry.

Columbia University, New York, N. Y.,
Organic Laboratory,
April 15, 1912.

THE EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

By M. I. Wilbert, Washington, D. C.

The inaugural meeting of the Eighth International Congress of Applied Chemistry was held at Washington, on September 4, under the patronage of the President of the United States, who, owing to an accident, was unable to take an active part in the opening meeting, but addressed the members later at a reception given at the White House.

The scientific and business meetings of the Congress were held in New York from September 6 to 13 inclusive. The Congress was attended by nearly 2000 chemists, coming from thirty different countries, and the general consensus of opinion appears to have been that in many respects at least this Congress has been the most successful ever held and that it should prove to be an important factor in the development of chemistry and related sciences in this country.

It is unfortunate that pharmacists, as such, did not see fit to take a greater interest in the proceedings of the Congress, for this calling is not alone the origin of applied chemistry, but is clearly dependent on applied chemistry for its present day existence and future continuance.

To illustrate the comprehensive nature of the Congress, it will serve to point out that more than 1000 papers had been placed upon the tentative official program and that a number of additional communications were accepted later and announced in the "Daily Journal." Despite the fact that in many, though not all, of the sections the officers ruled that a paper could only be presented by its author. The final report of the Secretary shows that 436 papers were presented and discussed in the several Sections of the Congress.

The twenty-four sections into which the Congress was subdivided were designated as follows:

I. Analytical Chemistry.
II. Inorganic Chemistry.
IIIa. Metallurgy and Mining.
IIIb. Explosives.
IIIc. Silicate Industries.
IV. Organic Chemistry.
IVa. Coal Tar Colors and Dyestuffs.
Va. Industry and Chemistry of Sugar.
Vb. India Rubber and other Plastics.
Vc. Fuels and Asphalt.
Vd. Fats, Fatty Oils and Soaps.
Ve. Paints, Drying Oils and Varnishes.
VIa. Starch, Cellulose and Paper.
VIb. Fermentation.
VII. Agricultural Chemistry.
VIIIa. Hygiene.
VIIIb. Pharmaceutical Chemistry.
VIIIc. Bromatology.
VIIId. Biochemistry, including Pharmacology.
IX. Photochemistry.
Xa. Electrochemistry.
Xb. Physical Chemistry.
XIa. Law and Legislation Affecting Chemical Industry.
XIb. Political Economy and Conservation of Natural Resources.

Sections VIIIb, VIIIa and VIIId, despite the fact that they dealt primarily with subjects of direct interest to pharmacy in the wider sense, appear to have been much less popular than some of the other sections, both in regard to the size of the published volumes of original communications and also in regard to space occupied in the official program.

Another rather disappointing feature in connection with the proceedings of the Section on Pharmaceutical Chemistry is the fact that of the eighteen communications presented to this Section but one was presented by its author at the meeting for which it was announced.

These were minor shortcomings, however, that were more than counterbalanced by the really interesting nature of the addresses made by some of the foreign delegates to the Congress, and the further fact that the Section on Pharmaceutical Chemistry was practically the only one to complete its program as printed.

The credit for this somewhat unique accomplishment is due primarily to the intrepid and always present chairman, Prof. Jos. P. Remington, and also, to a considerable extent, to the strenuous acting secretary, Mr. Otto Raubenheimer.

The varied nature of the several papers that were presented to this Section is well shown by the following more or less random selection of titles from the official program:

Francis Ransom and H. J. Henderson. "Belladonna. The Effect of Cultivation and Fertilization on the Growth of the Plant and on the Alkaloidal Content of the Leaves."

Francis H. Carr. "The Effects of Cultivation upon the Alkaloidal Content of Atropa Belladonna."

F. A. Miller and W. F. Baker. "The Potency of First Year Cultivated Digitalis Leaves as Indicated by Physiological Assay."

Henry Kraemer. "The Influence of Heat and Chemicals on the Starch Grain."

John C. Umney and E. J. Parry. "Unification of Processes for Commercial Analysis and Valuation of Essential Oils."

Atherton Seidell. "Solubility and Distribution Coefficients of Thymol."

H. V. Arny. "International Standards for Colored Liquids and a Suggested Method of Standardization."

All of the papers printed in the volume of original communications are of value, but because of the fact that the writers of the papers usually failed to present them in person many of the more valuable features were not sufficiently emphasized, and, therefore, an active interest in the work of the Section appeared to be lacking.

In addition to the papers announced on the regular program the Section listened to short addresses by F. Raschig and Hermann Vieth, of Ludwigshafen, Germany; K. Wooyenaka and Kintaro Wooyena, of Japan; Jokichi Takamini, of New York, one of the delegates of the Pharmaceutical Society of Japan; L. Weber, of Darmstadt, Germany; Rudolf Wegschneider, of Vienna, Austria; Frederick Power, of London, England; K. von Buchka, of Berlin, Germany, and Richard Lueders, of Hamburg, Germany.

The question of international standards for widely used medicaments was discussed at length and provisions made for securing the co-operation of other countries. The resulting resolution, as finally adopted by the Congress, was brought forward by the Commission on International Congresses, and, having received the unanimous endorsement of this body, was adopted.

As presented at the final meeting of the Congress it reads as follows:

Resolved, That Section VIIIb, of the Eighth International Congress of Applied Chemistry consider the feasibility of international standards of strength, purity, method of testing and nomenclature of pharmacopœial preparations.

Resolved, Section VIIIb (Pharmaceutical Chemistry) of the Eighth International Congress of Applied Chemistry, having received and discussed the report of the International Commission on "Variation in the Activity of Toxic Drugs," resolves that it is desirable that this inquiry be continued and that the International Commission be performed and to consist of the following eight members:

Austria, Prof. Wilhelm Mitlacher; France, Prof. E. Bourquelot; Germany, Prof. H. Thoms; Great Britain, Francis Ransom; Netherlands, Prof. L van Itallie; Russia, W. Ferrein, Mag. Ph.; Switzerland, Prof. A. Tschirch; United States, Dr. R. H. True, and the following three secretaries: G. P. Forrester, F.C.S., European continent; Peter McEwan, F.C.S., Great Britain; Otto Raubenheimer, United States.

It is further resolved that this commission be authorized to enlist the co-operation of other persons actively interested in promulgating international uniformity of standards for potent drugs and improvement in their cultivation and collection.

Resolved, That the International Commission of Congresses of Applied Chemistry be requested to approve the organization of an international committee under Joseph P. Remington, and composed of chemical experts approved by this commission, whose duty shall be to collect information from every available source on chemical products and the essential oils used in pharmacy, and to investigate the tests now in use to prove the identity and purity of said products and oils; also, to consider standards and tests with the view of establishing uniformity in the same throughout the world, and to report to the Ninth International Congress the results of its work.

Throughout the Congress it was evident that the delegates from all of the different countries were desirous of securing greater uniformity not alone in the standards of strength and purity of medicines, but also greater uniformity in the methods of examining and even of sampling various products, and quite a number of committees or commissions were appointed to report to the Ninth International Congress which is to convene in St. Petersburg, Russia, in 1915, under the active presidency of P. Walden, of Riga.

Among the resolutions looking to international uniformity in standards and in methods of examination was one recommending that for all commercial purposes the international atomic weight table for 1912 be used until the meeting of the next Congress.

Other resolutions favored international standards for disinfectants, standard methods for the analysis of food products, uniform regulations concerning organic coloring matters, and uniform methods for sampling ores and fuels.

The general lectures and reviews, of which four were held in the great Hall of the College of New York, were in many respects the most interesting and most important features of the Congress.

The first of these general lectures was delivered by the eminent French chemist, Gabriel Bertrand, Professor of Chemistry at the Sorbonne, Paris, France, who, in discussing the part played by infinitely small amounts of chemical substances in agriculture, stated that cultural experiments have proven that a variety of elements, even some of the rarer elements, are necessary to maintain the proper conditions for plant, and, therefore, also, for animal life, and suggested that a further study of this fact will no doubt lead to a fuller appreciation of the need for maintaining the widespread distribution of elementary substances.

The second general lecture, by Carl Duisberg, the President of the Verein Deutscher Chemiker, was a comprehensive review of the present status of the German chemical industry, and the contributions that have been made by German chemists to further the progress of various lines of work and research and more particularly the influence that chemistry has exerted on the progress of medicine and hygiene.

In commenting on the production of synthetic products for use as medicine, he pointed out that in this connection much brilliant work has been accomplished, and the prospects for future development are so promising and so far reaching that no one could safely venture an opinion on the limitations of this branch of chemistry. As an illustration of the future possibilities in connection with pharmaceutical medical chemistry, he called attention to the success that has already attended the work of Ehrlich in the line of chemotherapy.

In connection with efforts that are being made for the safeguarding of human life and the promotion of human welfare, he called attention to non-inflammable artificial silk, to acetyl-cellulose that is also non-inflammable and is said to be equal to nitro-cellulose for moving picture films and to non-inflammable celluloid. He also exhibited a large quantity of synthetic rubber and stated that the economical production of this substance was one of the possibilities of the very near future.

The third general lecture, by William Henry Perkin, of Manchester, England, was devoted to the discussion of the permanent fireproofing of textile fabrics, especially of cotton goods which are ordinarily subjected to repeated washings. While no figures were quoted it was intimated that the annual loss of life, due to clothing catching fire, was quite large and could readily be avoided by the adoption of proper safeguards for rendering clothing non-combustible.

The fourth general lecture was delivered by Giacomo Ciamician, of Bologna, Italy, who prophetically outlined some of the possibilities of the photochemistry of the future, and discussed more particularly the tremendous waste of solar energy at the present time.

In addition to the general lectures of the Congress itself, a number of special lectures and addresses were given before joint sessions of two or more sections. Two of these lectures, the one by Samuel Eyde, on the oxidation of nitrogen, and the one by H. A. Bernthsen, on synthetic ammonia, were of immediate and practical importance, because they announced the actual commercial utilization of atmospheric nitrogen in the production of nitric acid and of ammonia. These two substances it was pointed out have an ever widening field for use while the evident supply is restricted, and any undue increase must be provided for. This it is thought has now been satisfactorily accomplished by the electrolytic production of nitrogen compounds directly from atmospheric nitrogen.

A third lecture, by Prof. W. H. Perkin, on the polymerization of butadiene and isoprene, reviewed the work that has been done by various investigators in the production of synthetic rubber, and pointed out that by means of biologic processes it had become not alone practicable but also economically possible to produce true rubber from isoprene or other compounds made from starch containing or cellulose containing materials.

The importance of this discovery from a public health point of view becomes evident when we recall the many and varied ways in which this material contributes to the comfort and well-being of the human race and the important part it has taken in developing many of the now essentially necessary conveniences like the telephone.

The one predominant feature of the Congress appears to have been the more or less clear recognition of the part that the divisions of photo and of phyto chemistry are to take in the development of the chemistry of the future, and, therefore, also, in the promotion of the public welfare and the safeguarding of the public health.

While this feature of chemical progress was perhaps best reflected in the lectures by Bertrand and Ciamician, referred to above, it was also evidenced by numerous other communications, more particularly in the Section on Pharmaceutical Chemistry, where it was reflected by the discussions on the effect of cultivation on the alkaloid content of drugs and on the variability in the composition of essential oils.

The same thought was also evidenced by at least two of the foreign delegates to the Congress in their addresses before the Section on Pharmaceutical Chemistry: P. Walden, of Riga, Russia, and Gustav Komppa, of Helsingfors, Finland.

These gentlemen in calling attention to some of the contributions of pharmacy to applied chemistry pointed out that the apothecary was of necessity the original phyto chemist, and that while it is true that this branch of chemical study had more recently been overlooked or frowned down upon, it was destined to take a very important part in the development of chemistry and of civilization generally, in the future.

A review of the Eighth International Congress of Applied Chemistry would be incomplete without calling special attention to the really unique and practically ideal provisions for the business and scientific meetings provided by the trustees of Columbia University.

Practically all of the Section meeting places were in the buildings of the University and many of the members of the Congress were provided with sleeping quarters, in the residence halls, as guests of the University.

Other members were provided for in the immediate vicinity of the University, so that so far as these several features were concerned no fault could be found. The social features were numerous and varied, and it is to be hoped that despite a number of minor disappointments and the unseasonably warm weather the foreign delegates, as well as the American members, will remember the Eighth International Congress of Applied Chemistry as a brilliant success and as the direct incentive for progress in practically all of the ever-increasing lines of human endeavor in which chemistry can be applied.

ABSTRACTS OF PAPERS READ AT THE FORTY-NINTH MEETING OF THE BRITISH PHARMACEUTICAL CONFERENCE.

By John K. Thum, Ph.G., Pharmacist at the German Hospital, Philadelphia.

For the third time in its history, the British Pharmaceutical Conference held its forty-ninth annual meeting in the world-famous city of Edinburgh.

The sessions of the Conference were opened in the Debating Hall of the Edinburgh University Union on Tuesday, July 30. Sir Edward Evans, President, in the course of his address, remarked that he had just returned from a visit to the United States, and Canada, and had been very much impressed with the fact that the Government of the United States, in addition to being very particular as to the purity of all drugs sold in that country, have a Bureau of Plant Industry in connection with the United States Department of Agriculture. They issue bulletins from time to time, and mentioned four as follows: "The Wild Medicinal Plants of the U. S. A.," "American Root Drugs," "American Medicinal Barks," and "The Seeds and Plants Imported into the U. S. A." He believes that it is the investigations of this department that is the cause of the large increase in the use of barks, drugs, and roots of American origin. He thinks the Conference should consider the urging of their government to develop such a department as exists in the United States.

In making a plea for the cultivation of drugs in their own country, he calls attention to the adaptability of the soil for this purpose, stating that what it does produce is far superior to any plant drugs grown elsewhere, for example, digitalis, henbane, colchicum, valerian, belladonna, peppermint, lavender, etc.

Sir Edward also spoke of the constantly increasing consumption of Cascara Sagrada. It is estimated that the crop of this valuable bark reaches annually about one thousand tons. The consumption is now almost ahead of the supply.

Among the many interesting papers brought to the attention of the members of the Conference were the following:

THE SUITABILITY OF VARIOUS COMMERCIAL PROTEINS FOR PHARMACEUTICAL USE.

By F. W. Crossley Holland.

The wide employment of protein substances in the arts has led the author to inquire into their suitability for extended employment in pharmacy.

Among vegetable proteins he mentions wheat protein, valuable for the preparation of medicated foods; soya bean protein, which contains 32 per cent. of protein, and no starch which is unusual in a leguminous seed; and castor oil bean protein, a prolific source of protein to be had at a low cost, its chief disadvantage being the presence of a substance which is irritating to the mucosa of the digestive tract.

Among animal proteins those of chief interest are: egg-albumen, gelatin, serum-albumen, and milk casein. These have found a limited use in pharmacy as emulsifying agents, although their suspensory powers are remarkable. The uses of gelatin in pharmacy are well known, yet it might be interesting to note that a warm solution of gelatin is coming into use as an emulsifying agent and gives good results with fixed oils.

SUGGESTIONS FOR THE MORE EXTENDED CULTIVATION OF DRUGS.

By J. H. E. Evans.

The author states that while in the United States, Germany, and other countries the government departments are doing much to foster the drug plant industry, little assistance is given in England. Any advance which has been made is almost entirely due to private enterprise.

He states that the present source of supply of crude vegetable drugs are, in quantity and quality, restricted in area, and thus dependent on forces which cannot be controlled, such as weather, time and method of collection, labor available, and careless methods of preparing for market, leading to sophistication. He thinks that the influence of such natural causes might often, both as regards quality and quantity, be controlled by systematic cultivation, but that such cultivation must be scientific and organized.

Better attention as to time and method of collection has materially improved the quality of our crude drugs, and the author cites Belladonna root and Jalop root as examples in this regard; the former can now be obtained estimating 0.5 per cent. alkaloids and over; the latter can now be obtained containing resin well over the B. P. limit.

Among the causes of deterioration of drugs of vegetable origin inattention to proper drying is mentioned. Rapid deterioration of digitalis leaves by the action of enzymes when only air-dried is cited as an established fact.

The author also states that while cultivation appears to prevent the production of alkaloids in some plants, on the other hand, as in the case of cinchona, careful selection and cultivation have produced a strain which is much richer in alkaloid than any found in the wild state. Among the drugs which are cultivated more or less successfully at the present time he mentions the following: Calumba in Ceylon; eucalyptus and patchouli in the Tropics; belladonna in England, France, and America; coca in the West Indies, Ceylon and Zanzibar; kola nut in the Tropics generally; cinnamon in Ceylon; ginger in Japan; tumeric in the Tropics; ipecac in India, and to some extent in Brazil; valerian in England, Germany, and Austria; manna in Sicily; benzoin in the Strait Settlements; opium in the East, and many plants, such as peppermint, lavender, etc., in England.

Altogether the author makes an eloquent plea for drawing the attention of the government to the possibilities of drug cultivation in Great Britain and her Colonies. He states that it would be of benefit to the public generally and a practical means of working land and employing labor that is now unproductive.

ACTIVITY OF DIGITALIS LEAVES, AND STABILITY AND STANDARDIZATION OF TINCTURES.

BY GORDON SHARP AND F. W. BRANSON.

It was the author's object in the work accomplished on this paper to ascertain if a tincture made with 90 per cent. alcohol retained its activity for a longer time than the ordinary pharmacopœial preparation. It was thought that the glucosidal deterioration might be due to a ferment, and that a stronger alcoholic menstruum might destroy it. The physiological testing was done by noting the action of a 60 and 90 per cent. alcoholic tincture on frogs after the preparations had been made four months. They came up to standard, although on the whole the stronger alcoholic preparation was not quite as toxic as the other. After a further period of time a subsequent test showed that the stronger alcoholic tincture was much less toxic than the other. The authors believe that the stronger alcohol decomposes the glucosides of the plant.

The authors also believe that a potent preparation can be produced from either wild and half cultivated plants; also, that leaves gathered in November are as active as those gathered in August; that leaves from plants which had flowered and from plants which had not yet flowered were equally toxic.

NOTE ON CALCIUM LACTATE.

BY C. A. HILL AND T. T. COCKING.

This salt as at present commercially available, is not by any means uniform in composition. As the use of this salt is increasing in medicine and as our knowledge regarding its solubility is somewhat unsatisfactory the authors of this paper deemed it desirable that this substance be investigated. They find that a pure calcium lactate can readily be prepared by precipitation with acetone from its cold saturated solution, washing the precipitated salt with acetone and then with ether.

AN OIL FROM AN EAST INDIAN BARK.

BY E. W. MANN.

The author gives some data in reference to a bark, which passes by the name of "Lawang." It yields an essential oil heavier than water, with a striking odor recalling nutmeg, sassafras, and clove.

It is doubtless derived from some species of *Cinnamomum, Litsea,* or an allied genus. Twenty-four kilos were coarsely ground and subjected to steam distillation, 120 grammes of oil being obtained. On subjecting this to examination the following constants were determined:

Specific gravity (15.5°)	1.0104
Rotation (100 mm.) at 20°	6.97°
Refractive Index at 15.5°	1.5111
Refractive Index at 20°	1.5095
Acid value	1.15
Saponification value	43.02
Ester value	41.87
Saponification value of acetylated oil	121.91

Further examination of the oil showed the presence of a crystalline acid with a melting-point 51° to 52°.

NOTE ON THE DETERMINATION OF LEAD IN CHEMICALS.

By G. D. ELSDON.

One of the difficulties encountered in carrying out the colorimetric lead test of Warrington is that of preparing a clear and bright solution of the chemical, something most essential in tests of this character. It has been pointed out that filtration, as, for instance, cream of tartar, may lead to a loss of lead, which occurs in minute particles in the metallic condition.

While making an examination of a series of chemicals for lead the author found that the lead left on the filter paper might be removed by washing with about 10 c.c. of 0.6 per cent. acetic acid.

THE TEST FOR BRUCINE IN STRYCHNINE.

By D. B. DOTT.

The usual test for brucine in strychnine is to pour HNO_3 on the crystals and observe whether any red color is produced. According to the author this test is unsatisfactory in that it is hard to notice or define the tint which quickly changes to a darker color caused by the rapid action of the strong HNO_3 on the strychnine. He gives some experimental evidence which shows that the rapidity of this color change is very much lessened by moderate dilution of the acid,

NOTE ON THE OILS OF AMMONIACUM, GALBANUM, AND ELEMI.

By E. F. Harrison and P. A. W. Self.

The above-mentioned gum-resins have been stated to be largely used as adulterants of asafetida; in considering how far the amount and characters of the oil of asafetida could be used to judge of its purity, it became necessary to take into consideration the amount and characters of the oils of these other gum-resins. The authors state that their investigations disclose the fact that any considerable addition of ammoniacum to asafetida would materially reduce the yield of oil. They state, however, that this fact is of little value for its detection, as the proportion of oil in asafetida is very variable. In their opinion the best means of detecting ammoniacum at present is by the hypobromite test applied to suspicious-looking tears. It was also shown that any considerable addition of either galbanum or elemi to asafetida would lower the specific gravity and refractive index of the oil to a very marked degree, and increase the dextro-, or reduce the lævo-rotation.

CONCENTRATED TINCTURES.

By J. Haycock.

The writer states that with regard to many of the concentrated tinctures on the market it would be foolish to claim that, when diluted, they represent the tinctures of the British Pharmacopœia. He then goes on to give the results of his method of extracting a long list of drugs for this class of preparations. Briefly, his method is to percolate the drug with industrial methylated spirit of suitable alcoholic strength, until thoroughly exhausted, then distilling off the spirit, and dissolving the soft extract in the official menstruum. Obviously it is not of avail for drugs valuable because of their volatile principles. These preparations were found to yield their full alkaloidal contents. No evidences of methyl alcohol were found upon examination.

FURTHER DATA IN REGARD TO ASAFETIDA.

By E. F. Harrison and P. A. W. Self.

The authors give a paper which is supplementary to one read before the Pharmaceutical Society in London on the oil of asafetida and the valuation of the drug. They record the character of further samples, some very grossly adulterated with mineral matter. From the manner in which asafetida is gathered, it is inevitable that some foreign material should accompany it; but so long as the essential constituents, *i.e.*, the sulphur-containing constituents of the oil, do not fall below a reasonable limit, it seems absurd to condemn a parcel of the drug because pieces can be picked out of it here and there which do not show all the characters of the true drug.

NOTE ON IODINE-CONTENT OF THYROID GLANDS.

BY N. H. MARTIN.

The writer states that the iodine-content of thyroideum siccum from single glands varies more than the milk obtained from individual cows, and it is obviously as inadvisable to talk of fixing a standard from assays on a few glands as to fix a milk standard from analyses of milk obtained from a few animals instead of from herds. He also gives a tabulation covering a total number of over 6500 lobes, each estimation being made on the bulked product of some hundreds. His results are contradictory to the statement of Koch that there is three times the amount of iodine in Thyroideum Siccum prepared during the winter months as there is in that prepared in June and July. There is considerable range in the iodine-content, from 0.3 to 0.4 per cent.; which seems to indicate that so low a standard as 0.15 per cent. should not be adopted.

COMMERCIAL ESTERS USED IN PERFUMERY AND FOR FLAVORING PURPOSES.

BY JOHN C. UMNEY AND C. T. BENNETT.

The flavor and "bouquet" of fruits are largely due to the presence of certain organic esters, and in making artificial flavoring-essences a considerable quantity of synthetic esters or "ethers" is employed. The authors state that impurities having objectionable odors must cause much difference when using artificial flavorings. They also state that the manufacture of pure products is dependent largely on the purification of both acids and alcohol; this point is emphasized where amyl alcohol and butyric acid is used. A review of an examination of a number of commercial samples is given and the statement made that the physical characters, such as specific gravity, solubility, and range of boiling-point, are useful factors in judging purity, as is likewise the refractive index.

A NOTE ON THE DETERMINATION OF NITRATES IN BISMUTH CARBONAS, B. P.

BY WALTER RYLEY PRATT.

Seventeen samples of bismuth carbonas collected from various sources were examined by the author. He states that they were of varying specific gravity; some light and flocculent, others heavy and dense. In qualitatively testing for nitrates two color tests were used—the well-known brucine test and a new test, discovered by the author, which he claims is more delicate. It consists in the formation of an intense blue color on the addition of brucine, resorcinol, and concentrated H_2SO_4 to a nitrate. Only one sample showed the complete absence of nitrates by both tests, two gave a slight reaction, and fourteen showed the presence of considerable nitrate. He thinks that a limit of 2 per cent. of total nitrate calculated as $BiONO_3$ is generous and that it can be easily determined by his test. Considerable sulphates were also present, no doubt coming from sodium carbonate used in the manufacture; he advises more complete washing, and insists that a limit to alkalinity would be advisable.

Other papers read at the Conference were as follows: The Preparation of Bacterial Vaccines, by Ian S. Stewart, M.D. The Potency and Keeping Properties of Some Galenicals as Determined by Physiological Tests, by Alexander Goodall, M.D. The Formaldehyde Solution and Tablets of Commerce, by C. H. Hampshire and S. Furnival.

A Glucosidal Constituent of Ipecacuanha, by H. Finnemore and Dorothy Braithwaite.

Note on Hyoscine Hydrobromide, by H. Finnemore and Dorothy Braithwaite. The Measurement of Relative Tryptic Activity, by A. R. Schmidt. The Solubility of Ether in Normal Saline Solution, by Reginald R. Bennett. Unrecorded Microscopical Characters of Bael Fruit, by J. C. Shenstone. Japanese Aconite Root, by E. M. Holmes. Japanese Chillies, by E. M. Holmes.

BOOK REVIEWS.

The Plants of Southern New Jersey, with especial Reference to the Flora of the Pine Barrens and the geographic distribution of the Species. By Witmer Stone, Curator Academy of Natural Sciences of Philadelphia. Trenton, N. J.

The New Jersey State Museum publishes almost annually an educational report for the benefit of the schools and of the people of the State. Any one who is familiar with the flora of the pine barrens of New Jersey can readily appreciate that the Curator of the State Museum would receive many requests for information concerning the plants of this interesting section and that there would be a strong sentiment among teachers for a book in which the plants of New Jersey are considered. Mr. Stone, who is well known for his field work on mammals and birds, and is very familiar with the flora of New Jersey, was selected to prepare an extensive work on "The Plants of Southern New Jersey."

The entire work consists of 828 pages with 129 plates of illustrations. The individual plants are not described and it is therefore expected that the work will be used in connection with one of the general botanical manuals. It shows, however, exactly which of the plants, described in the more general books, are to be found in Southern New Jersey and in what sections they are to be looked for. The basis of the present work is the field studies of Mr. Stone and a number of the members of the Philadelphia Botanical Club, some of whom are now deceased, as well as the published records contained in the several botanical works dealing with the region. "Wherever possible an actual herbarium specimen is cited for every locality mentioned under each species, so that questions of correct identification can readily be settled in the future by consulting this material."

This work is not only of interest to teachers and students of local botany but is of particular interest to botanists and naturalists generally, for in it is contained much information concerning the present condition and history of one of the most interesting botanical areas in the United States, and which is still one of the most extensive areas of the Middle States left in primeval condition. In his introduction Mr. Stone says: "This coastal plain region of New Jersey has always attracted the attention of naturalists because of the striking differences that are presented by its flora and fauna as compared with those of the higher ground of the Piedmont County to the north and west of it. Pennsylvanians often liken it to a bit of the Southern States that has been transported northward. Its climate in winter is certainly milder; there is rarely a heavy snowfall, and what does fall soon disappears, while many Southern species of plant and insects and a few birds and mammals are found there which are unknown to the west of Philadelphia or elsewhere beyond the fall line. It may seem incongruous to find a 'Southern flora and fauna' by going eastward, as we do in the city of Philadelphia, but this is easily explained when we examine a map of the life zones of North America." Mr. Stone discusses in his introduction (a) the nature of the life zones and floral belts of Eastern North America; (b) the relationship between the flora of the coastal plain and that of the Piedmont Region; (c) the general geographical distribution of the plants comprising the flora of the New Jersey coastal plain; (d) the botanical subdivisions of the New Jersey coastal plain; (e) the special interesting features of the pine barrens, giving a list of the plants occurring there; (f) the plants of the coastal strip; (g) the plants of the Cape May district; (h) the maritime flora; (i) and finally the origin and relationship of the coastal plain flora of New Jersey.

It is very seldom that one finds in a book of this character so much of the individuality of the author. Mr. Stone has devoted much of his time to field work. He is furthermore thoroughly conversant with the explorations and collections of his colleagues engaged in botanical work, and views the living plants in the spirit of the plant-geographer or ecologist. By reason of his numerous observations and the copious notes which he has incorporated with nearly every species, Mr. Stone has written a work which will be of incalculable benefit to future students of botany and science, for it is a permanent record of a region that is rapidly undergoing the inevitable changes incident to deforestation, cultivation and settlement and it will be exceedingly difficult for the naturalists of the future to understand these changes without this connected record.

While there are very many features of this work that one is tempted to touch upon in a review, yet one of the most interesting that may be noted is his handling of the nomenclature question. He follows "the American Botanical Code except in the treatment of species and sub-species." While there may be an opportunity for differences of opinion on this question yet it is quite likely that botanists will ultimately agree with the zoologists and not place species and sub-species on different planes, whereby a plant may bear one name if it is recognized as a species and another if it is called a species. In addition to his commendable attitude on this mooted question we are also to note that he has consistently followed the entering of *all* specific names with a lower case initial letter, according to the custom prevalent among zoologists. This is a great step in advance and is one that must be universally followed if we are to expedite our work. For after all we use names as a means to an end. These must be simplified so that it is not necessary to be continually using standard works of reference to determine whether the initial letter should be capitalized or not. We have troubles enough with nomenclature and we should devote more time in studying the plants and animals, their habits, etc., and everything that will simplify our work must lighten our labors and add to our knowledge of plants and animals.

H. K.

Elements of Vegetable Histology. For the use of students of Pharmacy, preparatory to the Study of Pharmacognosy. By Daniel Base, Ph.D., Professor of Chemistry and Vegetable Histology in the Department of Pharmacy, University of Maryland, Baltimore. Published by the author. 1912.

The author has for some years given considerable attention to the elaboration of the fundamental principles required in order that students in pharmacy might be well prepared to take up the study of pharmacognosy. The present work is the result of Dr. Base's many years' experience as a teacher and is to be commended. There are 26 chapters. In the first chapter, consisting of 31 pages, attention is given to the use of the microscope. Seven chapters are devoted to the consideration of some of the principal cryptogamic plants. The study of tissues and cell contents necessarily receive a much more extended treatment and 16 chapters are given to these subjects. There is also a brief chapter on the examination of sputum for the bacillus of tuberculosis and of gonorrhœal discharge for gonococcus. In the appendix will be found much practical information regarding reagents, the making of permanent mounts, etc.

All sincere students in pharmacognosy must welcome a book of this character, for it is only when the teachers engaged in this work are willing to take pains to develop their courses that we may expect the recognition on the part of analysts and pharmacists as to the practical value of the results in pharmacognosy. The subject is a difficult one and we must expect each teacher on this subject to contribute his share in solving the fundamental problems connected with the presentation of this subject so that the student may master the necessary technique.

The work is illustrated with some 65 illustrations, most of which are taken from other works. We must commend Dr. Base for giving credit in connection with each illustration to the author of the original drawing. This practice has not been by any means universally followed by the authors of text-books in the United States and while we have often been inclined to call attention to this dereliction on the part of some authors yet for several reasons we have refrained from any such expression. We trust, however, that in calling attention to this elementary principle of justice to other authors that has been followed by Dr. Base, that all writers of text-books in the United States will in the future follow his example, for how can a teacher preach "the honor system" to his students when his practices are contrary to his teachings?

H. K.

THE STATE PHARMACEUTICAL EXAMINING BOARD OF PENNSYLVANIA.

Notice of Examinations.

Examinations for applicants desiring registration as Pharmacist or Qualified Assistant Pharmacist, will be conducted in the Philadelphia College of Pharmacy, 145 North Tenth Street, the Philadelphia Central High School, corner Broad and Green Streets, Philadelphia, and the Pittsburgh College of Pharmacy, corner Pride and Bluff Streets, Pittsburgh, on Friday and Saturday, November 8th and 9th, 1912.

Pharmacist Examination.—The Laboratory examinations will be given in the respective colleges of pharmacy on Friday morning, November 8th, 1912. Class No. 1 will meet at 9 o'clock and Class No. 2 at 11 o'clock. The Written and Specimen examinations in the Pittsburgh College of Pharmacy and Philadelphia Central High School on Saturday afternoon, November 9th, 1912, at 1 o'clock.

Assistant Pharmacist Examination.—At the Pittsburgh College of Pharmacy, corner Pride and Bluff Streets, Pittsburgh, Pa., and the Philadelphia Central High School, corner Broad and Green Streets, Philadelphia, Pa., on Saturday afternoon, November 9th, 1912, at 1.30 o'clock.

L. L. Walton, *Secretary*,
P. O. Box No. 395. Williamsport, Pa.

Florence Yaple
1865–1912

THE AMERICAN
JOURNAL OF PHARMACY

NOVEMBER, 1912

FLORENCE YAPLE.

Miss Florence Yaple, who was closely identified with the work of this JOURNAL for nearly twenty years, died at her home in Philadelphia on Wednesday evening, October 9th, after a long illness.

Miss Yaple came from a stock which had been well known in Ross County, Ohio, since 1812, the family having settled in America some half century earlier. Her parents were well educated and both were fond of nature; her mother it is said knew nearly all the flowers and birds in their vicinity. The Yaples lived on a farm in Hallsville, near Chillicothė, where Miss Florence was born on August 24, 1865.

Upon the death of her mother Miss Yaple, then but twelve years of age, took charge of the home and in spite of household duties succeeded in educating herself so well that at the age of sixteen she was able to become a teacher in the district common school.

As a consequence of attending the meetings of the Teachers' Institute in Chillicothe, Miss Yaple felt that she must enlarge her sphere of activity and do something more than teach in the district school, especially as the term was limited to but a few months in the year. She, therefore, attended the summer school at Ada, Ohio, with the view of becoming qualified to do more advanced work. She soon relinquished teaching, however, to take up the study of pharmacy. The nearest college of pharmacy was in Cincinnati; she matriculated there in 1888–1889, taking one course of lectures, and on August 14, 1889, passed the examinations of the Ohio State Board of Pharmacy and became registered as an assistant pharmacist.

Miss Yaple probably would have had difficulty in obtaining in a

Cincinnati drug store the experience required to obtain a manager's certificate. It so happened that while holding the position of secretary of the Equal Rights Society of Chillicothe she was sent as a delegate to the State Convention which met during the summer of 1890 at Massilon, Ohio. This was a most fortunate occurrence for her and proved to be the turning point in her life, for while attending this convention she learned that Dr. Suzan Hayhurst of the Woman's Medical College Hospital in Philadelphia would probably give her an opportunity for securing the experience she desired in compounding prescriptions, which would enable her to obtain the coveted manager's certificate and conduct a pharmacy. Miss Yaple succeeded in being appointed assistant to Dr. Hayhurst in the Woman's Medical College Hospital and served from May 4, 1891, to April 1, 1893. After this she held a position in the drug store of Dr. David F. Swisher, in Darby, until December 1, 1894, when it became necessary for her to devote her entire time to her work as Business Manager of the AMERICAN JOURNAL OF PHARMACY, a position to which she had been appointed by Prof. Henry Trimble in October of the same year.

Miss Yaple proved to be especially fitted for journalism and Professor Trimble deserves great credit for his selection. In addition to her services on the JOURNAL Miss Yaple also acted as research assistant to Professor Trimble.

While at the Woman's Medical College Hospital Miss Yaple matriculated in the Philadelphia College of Pharmacy, completing the regular course in 1895 and receiving the degree of Ph.G. Her graduating thesis, entitled "Some Commercial Cocoas," was published in this JOURNAL for June, 1895. It is a valuable piece of work and her results have been frequently cited by writers on organic analysis.

When I became editor of this JOURNAL Miss Yaple continued as Business Manager and soon was virtually Associate Editor as well as my research assistant. In both capacities she proved invaluable. All of her work was characterized by a high degree of thoroughness. This was evidenced in every department of the JOURNAL from the reading of proof and the preparation of the annual indexes, up to the handling of the JOURNAL'S finances.

She became a life member of the College in 1903 and was made a member of the Publication Committee at the annual meeting on March 26, 1906. While not a member of the Committee on Pharmaceutical Meetings, for more than fifteen years she acted as the secretary of these meetings and prepared the minutes for publication. These minutes may be considered as models of their kind; they were very carefully prepared and no pains were spared by her in verifying the citations and statements made in the course of the discussions. Miss Yaple was for a number of years a member of the Executive Board of the Alumni Association of the Philadelphia College of Pharmacy; for several years she also served as chairman of the Memorial Committee of this association and prepared appropriate biographical sketches for the *Alumni Report.* In 1901 when I was requested by Dr. Charles Rice, Chairman of the Committee of Revision of the U. S. Pharmacopœia, to take charge of the preparation of Part 3 of the "Digest of Criticisms on the U. S. Pharmacopœia VII," this work was prepared by Miss Yaple under my supervision as stated in the Letter of Transmittal in the published volume.

Miss Yaple was naturally a student and in her spare time attended special lectures and took courses of instruction in other institutions, continually striving to add to her fund of knowledge. She was a reader of the best works in philosophy, science, and literature. She took pleasure in wood-carving, in which she was quite proficient, although since coming to Philadelphia the demands upon her time allowed very little opportunity for the practice of this art.

Always modest and retiring Miss Yaple was well satisfied with a knowledge that her efforts were appreciated. She was always willing to help students and members of the College when they came to the JOURNAL rooms to seek for information. Furthermore, her work for others was always done in as careful a manner as though it were done for herself. By reason of her familiarity with the traditions of the College and her loyalty to its work her influence stimulated and benefited those around her. The reputation of an institution is founded on just such conscientious service as Miss Yaple rendered the Philadelphia College of Pharmacy; her example is well worthy of emulation.

HENRY KRAEMER.

THE THALLEIOQUIN TEST.

By Charles H. LaWall.

The thalleioquin reaction, from Thallos (green twig) and quinia, is one which has been in use for many years for distinguishing certain of the cinchona alkaloids. It was discovered in 1835,[1] accidentally by J. J. Andre, Professor of the Military Hospital of Instruction at Metz, who endeavored to ascertain the composition and character of quinine, and believing it to be a resinate of ammonia applied various reagents to it with a view of proving his contention. The application of chlorine water to a solution of quinine sulphate, followed by ammonia water, led to the production of the beautiful green color which is so characteristic of this reaction and its subsequent description in the memoir presented by the author to the Society of Pharmacists in Paris.

In 1840,[2] Brande, who is erroneously credited in the latest edition (4th) of Allen's Commercial Organic Analysis with being the author of the test, made some subsequent observations and placed the test upon a more satisfactory basis and it was adopted as one of the distinguishing tests for quinine in the 1840 United States Pharmacopœia, and has been continued in every subsequent edition of that work.

In 1877,[3] Henry Trimble proposed the use of the test for the quantitative determination of small amounts of quinine and in 1880,[4] Frederick Zeller reviewed the test and discovered that bromine water was a more sensitive reagent than chlorine water. Other investigators in the meantime had ascertained that quinine was not the only cinchona alkaloid which gives this reaction but that it was produced by quinidine, cupreine, hydroquinine, hydroquinidine and diquinicine, and also that variations of color can be produced by the addition of other reagents like potassium ferrocyanide, which produces a bright crimson color.

In 1894,[5] Prof. Theodore G. Wormley published a comprehensive research upon the comparative value of several of the known tests for the recognition of quinine in which he arrived at the conclusion that the thalleioquin test could be used for the detection of 0.00025 gm. in 5 c.c. of solution or 1 in 20,000, while the herapathite test which results in the production of the characteristic crystals of quinine iodosulphate is only sensitive in solutions of 1–1000 and then with great difficulty.

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[1] Amer. Jour. Pharm. 1837, p. 208.

[2] Amer. Jour. Pharm. 1840, p. 36.

[3] Amer. Jour. Pharm. 1877, p. 151.

[4] Amer. Jour. Pharm. 1880, p. 385.

[5] Amer. Jour. Pharm. 1894, p. 563.

Professor Wormley observed that the fluorescence of solutions of quinine which have been acidulated with sulphuric acid is one of the most characteristic of its properties and may be observed in a 1–100,000 solution when examined under favorable lighting conditions. The bitter taste, also, he observed is detectable in solutions of 1–20,000.

The thalleioquin reaction as originally described in the 1840 U. S. P. is as follows:

"The aqueous solution upon the addition first of chlorine and afterward of ammonia, assumes a green color."

This description was not essentially altered until the 1890 U. S. P., when it was changed to read as follows:

"On treating 10 c.c. of an aqueous acidulated solution (about 1 in 1500) of quinine with 2 drops of bromine water and then with an excess of ammonia water, the liquid will acquire an emerald green color."

Practically all of the later observers had reported great variation in the intensity of the color produced in quinine solutions of the same strength when subjected to varying conditions of acidulation, proportion of chlorine or bromine water, etc., thus making it valueless as a quantitative method.

The reaction forming a striking lecture table experiment when performed upon a large scale, it was adopted by Professor Joseph P. Remington a number of years ago in teaching at the Philadelphia College of Pharmacy, to illustrate the lecture upon the cinchona alkaloids. It was observed by him and afterward reported in Zeller's paper, that when a small amount of ammonia water, insufficient to produce the green color, is added, a beautiful rose color is developed. This is more easily produced when working with large quantities than when experimenting in test tubes, and the following proportions have been found to be satisfactory for lecture table demonstration to illustrate the green and rose colors respectively:

	Green	Rose
Solution of Quinine Sulphate 1–10,000, 4 litres	Chlorine water 500 c.c. Ammonia water 30 c.c.	Chlorine water 500 c.c. Ammonia water 3 c.c.

At the time of the adoption of the U. S. P. VIII, the former chlorine water was replaced by Liquor Chlori Compositus, a preparation made by acting upon potassium chlorate with hydrochloric acid and then diluting with water. This solution resembles chlorine water in containing about 0.4 per cent. of free chlorine, but differs from it in containing some free hydrochloric acid and also some oxyacids of chlorine as well as some salts of potassium.

The first attempt to produce the lecture table test using the compound solution of chlorine resulted in failure and subsequent experiments showed that no reaction or at most a faint and fugitive color could be obtained with the extemporaneously prepared chlorine water.

I did not have time to investigate the matter then and left it rest for several years, going back to the regular chlorine water for the test. In 1908 it was suggested to Ralph Nelden, then a senior student at the Philadelphia College of Pharmacy, to take up the subject for his graduating thesis and ascertain the cause of the failure to obtain the reaction when the compound solution of chlorine was used. Mr. Nelden's experiments (suggested and outlined by me) were comprehensive and satisfactory, leading to the undoubted conclusion (by a process of elimination) that neither potassium chlorate, potassium chloride nor hydrochloric acid interfered with the test but that the presence of the oxyacids was responsible for the failure of the test.

Nelden also experimented with the oxysalts of bromine and strange to say found that the analogous bromine preparation made by the action of hydrobromic acid upon potassium bromate, produced a reagent which was even more sensitive than the bromine water alone, and Nelden reported successful results of the test using this new reagent in dilutions of quinine 1 in 35,000.

As I have been frequently called upon to test for the presence of quinine in proprietary medicines, bitters, etc., when the proportion is often very minute and when other and possibly interfering alkaloids may be present, Nelden's results interested me to the extent that I duplicated his entire work, verifying all of his conclusions and making some additional observations and experiments.

I observed that when the reaction was tried upon solutions in which the amount of alkaloid was unknown the experiment had to be repeated, using varying quantities of bromine water until the proportion best suited for the particular dilution was ascertained. I found also that by still further diluting Nelden's reagent the results were much more satisfactory. The reagent, which should not be more than several weeks old, is prepared by me as follows:

Potassium bromate	0.5	gm.
Hydrobromic acid diluted (10 per cent.)	10	c.c.
Water, q.s.	100	c.c.

Dissolve the potassium bromate in the diluted hydrobromic acid and when the solution is complete add the water.

I also discovered the fact that more dilute solutions, in large volumes (50 to 100 c.c.) gave better results than smaller quantities and there is no difficulty whatever in getting a reaction in a solution of quinine sulphate as dilute as 1 in 100,000, or even 1 in 200,000, where the following procedure is followed:

Take 100 c.c. of the solution in a Nessler tube or a tall cylindrical bottle, add 5 to 10 drops of the reagent mentioned above, agitate well and immediately add 10 drops of stronger ammonia water and again agitate. In a dilution of 1 in 10,000, viewed in a column 5 c.m. deep, the tint is that of No. 376 *vert bleu* (Code des Couleurs, Klinksieck et Valette), while in a 1 in 50,000 solution viewed in the same manner, the tint is 336 *vert,* and in a 1 in 100,000 solution, similarly observed the tint is 303 c. *vert.*

I then made experiments to ascertain the best method of applying the reaction to unknown solutions and proceeding on the basis of a drug or a fluidextract (concentrating more dilute preparations accordingly) the procedure is as follows:

To 1 c.c. of the liquid or 1 gm. of the solid add 20 c.c. of ether in a large stoppered test tube. Make alkaline with ammonia water and shake well. After separation pour off the ethereal solution as completely as possible into a watch glass and allow it to evaporate. Take up the residue with 1 c.c. of tenth normal sulphuric acid, dilute with water to 15 c.c., transfer 5 c.c. to a tall cylindrical bottle and dilute to 100 c.c., add 5 drops of the bromine reagent described above, agitate well, add 10 drops of ammonia water, agitate again. Compare the color with a specimen of plain water made up to the same volume. If the first test is negative, make another, using 10 c.c. of the acid solution of the alkaloid, diluted to 100 c.c. as before. If no green color is produced in either of these tests, cinchona alkaloids are absent or present in an amount less than .0001 gm. which is the amount capable of detection by this method of procedure. Sometimes it will be found necessary to purify the alkaloid by a second shaking out with ether.

Check tests were made, using mixtures of cinchona and the following drugs: Aconite, belladonna, colchicum, conium, gelsemium, guarana, hydrastis, hyoscyamus, ipecac, nux vomica, opium, physostigma and phodophyllum and none of them were found to inhibit the reaction at all.

A STUDY OF AMERICAN GROWN CANNABIS IN COMPARISON WITH SAMPLES FROM VARIOUS OTHER SOURCES.*

By C. R. Eckler and F. A. Miller.

Several factors have recently given rise to considerable comment on the subject of American Cannabis. Of these, perhaps the most important are: the increased cost of the Indian drug, resulting in the search for a cheaper product; the none too well supported claims made by some investigators, leading, we believe, to a false conception of the activity of commercial lots of drug; the question as to whether or not an active variety can be successfully cultivated in this country on a commercial scale; and the question of the feasibility of including the American variety in the coming revision of the United States Pharmacopœia. The influence upon the activity of the drug of such factors as soil, climate, geographical location, time of harvesting, method of curing, and parts of plant included, are also of interest.

Famulener and Lyons[1] claim that the character of the soil and the geographical area where grown, primarily influence the activity of the plant. Holmes[2] reported on French, African and Indian

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*Reprinted from original communications, Eighth International Congress of Applied Chemistry, Vol. xvii, p. 23.

[1] Famulener and Lyons: Proc. Am. Pharm. Assoc., 1903, 51, 240.

[2] Holmes: Pharm. Jr., 1905, 74, 550.

Cannabis in 1905 to the effect that although the French and African varieties indicated some activity, they were not nearly so active as the Indian drug and could not be recommended for manufacturing purposes. He reported the African as being a little more active than the French. Houghton and Hamilton,[3] in 1908, named seven different sources from which they had tested samples, three being within the United States. In their conclusions they claim that Cannabis sativa, when grown in various localities of the United States, is found to be fully as active as the best imported Indian grown Cannabis. True and Klugh [4] grew plants from foreign seed and commercial drug, at Washington and southern Texas. They reported that the home grown drug was found to be fully equal in efficiency to the imported article. Hamilton [5] called attention to the fact that " various investigators," whom he failed to name, have examined American hemp and obtained results which indicated that the influence of soil and climate does not affect the quality of the extract.

Our interest in the different phases of the Cannabis situation has led us to report our experience with various commercial samples of the drug, and to state in brief the results of our work on the experimental cultivation of the American and Indian varieties. Materials for these investigations were obtained by growing plots, experimentally, both from the foreign and native seed. The following tests were carried out on various samples collected from these plots.

CULTIVATED CANNABIS.

Where grown.	No. of sample.	Percentage activity compared with good Indian grown samples.
Plot A	B-176	Approximately 40 per cent.
Plot A	1494	Approximately 50 per cent.
Plot B	B-596	Approximately 60 per cent.
Plot C	B-770	Not more than 50 per cent.
Plot C	B-771	Not more than 50 per cent.
	B-703	Approximately 65 per cent.
Plot D	B-177	Approximately 40 per cent.
Plot E	1493	Approximately 40 per cent.
	B-437	Approximately 50 per cent.
	B-693	Not more than 50 per cent.

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[3] Houghton and Hamilton: AM. JR. PHARM., 1908, 80, 21.

[4] True and Klugh: Proc. Am. Pharm. Assoc., 1909, 57, 843.

[5] Hamilton: Jr. Am. Pharm. Assoc., 1912, 1, 201.

The samples, on which the foregoing assays were made, were obtained under the following conditions: Seeds from an active commercial lot of Indian Cannabis were taken for experimental planting. A good stand of plants was easily obtained from these seeds. The plants were grown under ordinary agricultural conditions, upon a soil consisting of rather poor clay loam. The plants as observed on a plot (*A*) thirty by sixty feet, exhibited a wide range of variations. These variations were indicated by such botanical characteristics as size, color, and form, as found in leaf, plant, and inflorescence, date of flowering and time of maturity. Twelve plants from this plot (*A*) were of dwarf habit, from one to two feet high, and free from branches. These plants flowered early. They produced pistillate flower clusters which were heavy, compact, and leafless, averaging from two to four inches in length. They bore much resin and possessed the characteristic odor of Indian Cannabis. The three earliest flowering of these were selected for seed plants. August 17, 1909, the pistillate inflorescence of the twelve dwarfs was collected for testing. The sample was cured at room temperature and designated by No. B–176. The remainder of the plants in plot *A* were from three to seven feet high, much branched, and produced small inconspicuous flower clusters which were late in appearing. They showed but few resin bearing glands and did not possess the odor of foreign Cannabis to such a marked degree as noticed in the dwarf plants. August 24, 1909, the pistillate tops, including several inches of leafy stem, were collected for testing. The sample thus obtained was dried at room temperature, and designated by No. 1494.

The seeds selected from the three early flowering dwarfs were planted the following year on plot B. The plants obtained were a great improvement over the parents of the previous year. They averaged from two to five feet in height and were more branched. The inflorescence was long (averaging over twelve inches), dense, heavy, and carried much resin. Individual flower clusters were observed, measuring fourteen inches in length and bearing no leaves except the small bracts subtending the flower clusters. September 7, 1910, a collection was made from twelve of the best plants. The sample thus obtained was cured at room temperature, and tested under No. B–596.

At the same time, seed plants were selected. These selections were made for the purpose of continuing and improving the strain, as follows: first, from one plant bearing the largest inflorescence, which in this instance measured fourteen inches in length; second, from one plant showing a deep purple color in all parts; and third, from twelve of the best remaining plants, the size of the inflorescence serving as a basis for the selection. The following year the seeds from these selections were planted on plot C. The resulting crop consisted of uniform plants, very much like the parents in most cases. One marked exception was the appearance of the purple color in many plants from each of the other selections. It predominated, however, in the second selection. The first selection resulted in low, almost unbranched individuals. The pistillate flowering tops averaged ten inches in length, and produced more leaves than the parent form. A collection was made from these plants, for testing, on October 13, 1911. This sample was taken from the twelve best plants and tested under No. B–770. The second selection gave rise to individuals, all but a small proportion of which possessed the purple characteristic to a marked degree. The pistillate tops averaged one foot in length but were of a more interrupted nature and not so dense as noted in the parent plants. A collection was made from these plants October 13, 1911, and designated by No. B–771. No collection was made from the third selection. From sample B–770 three individual plant selections have again been made; first from one plant four feet high, and unbranched, which produced a large, single leafless inflorescence; second, from one plant three feet high, unbranched, which produced a large, single leafy inflorescence; and the third from one plant four feet high, which was divided near the top into several short branches. All of these produced good flower clusters, with numerous leaves. The strain showing the purple character was discontinued.

Sample B–703 was grown from seeds taken from a commercial lot of Cannabis Indica, No. 1728. These plants were unusual as to size and vigor, but produced an extremely low percentage of flowering tops.

Samples No. B–177 and 1493 were grown from seeds of American hemp, obtained in Lexington, Ky. The location of the plots (D and E) and the conditions of growth were practically the same as those for the foreign seed. The tops of this variety were very poor, being small and bearing a large proportion of leaves. August 17, 1909, a sample was collected which consisted largely of leaves and stems. This was dried at room temperature and tested under

No. B–177. A second sample for testing (1493) was collected, August 24, 1909. The drug was spread thinly in the field for twenty-four hours, during twelve of which it was exposed to direct sunlight. Drying was then completed under shelter. The following year another planting was made from the Kentucky seed under practically the same conditions. The character of the plants was the same as noted for the preceding year. A sample of the leafy tops was tested under No. B–437. No further investigation has been made of this form. The pistillate inflorescence was in all cases very small, leafy, and lacking in resin and the true Cannabis odor.

Sample No. B–693 was obtained from one extremely large and luxuriant plant. This plant was observed in a hardy border, and was tested on account of its extreme size and the very favorable appearance of its inflorescence. The exact source of the seed is not known.

In order to gain some information regarding the activity of commercial lots of American Cannabis a number of samples were purchased from drug brokers and tested physiologically. The method in brief is as follows:

METHOD OF PREPARING DOSES FROM CRUDE DRUGS.

A 20 gramme sample of the drug in No. 60 powder is macerated with official alcohol in a small flask, which is occasionally agitated, for from 48 to 72 hours. The content of the flask is then poured into a narrow percolator. Percolation is allowed to proceed slowly, more alcohol being added as necessary. The first 90 c.c. of percolate are reserved; 100 to 150 c.c. more are then collected, evaporated under an air jet without heat, added to the reserved 90 c.c. and made up to 100 c.c. Doses of this 20 per cent. tincture are calculated, for each dog, per Kgm. of body weight. The quantity is drawn off with a pipette, evaporated without heat to an extract consistency, and made into a pill or put into a capsule.

In order to determine with certainty whether or not the active principles were completely extracted by the foregoing method, on several occasions the drug was returned to the flask and again macerated and percolated. One hundred c.c. of percolate were reduced, made into a pill, and given to a small susceptible dog. In no case were noticeable symptoms produced.

METHOD OF TESTING.

The work is carried out on fox terriers which are kept in well ventilated, comfortable stalls. These stalls are arranged in a row, and so constructed that the dogs cannot see each other, or any object about the room which might disturb or excite them. The assays are made by one person, usually, who endeavors to maintain a thorough acquaintance with the normal movements of each animal. When a preparation is to be tested one, two or three pairs of dogs are selected which have previously been standardized against Cannabis preparations. The animals are fasted for twenty-four hours, and then to one of a pair is given (by mouth in pill or capsule) a dose of a standard preparation, and to the other a dose of the unknown. The animals are observed almost constantly during the period between one and three hours after the administration, and the results noted. After this, the animals are allowed sufficient time for recovery and complete excretion of the drug, usually about three days, and then the drugs are given again, this time in the reverse order. The next time the order is again reversed and so on. The doses are increased or diminished, according to the effects previously produced, until the minimum amount of each preparation necessary to produce slight but distinct inco-ordination of the muscles is determined.

The dose of the unknown required for a given animal is compared with that required of the standard. The results on the several animals are then compared and conclusions drawn.

AMERICAN CANNABIS FROM VARIOUS COMMERCIAL SOURCES.

No. of Sample.	Extractive.	Percentage activity compared with good Indian grown samples.	Commercial Source.
1032		Not more than 20 per cent	Indianapolis
B-407		Not more than 50 per cent	St. Louis
B-529		Not more than 40 per cent	New York
B-824		Not more than 65 per cent	Indianapolis
B-1034	7.98 per cent	Not more than 50 per cent	St. Louis
B-1040	11.08 per cent	Not more than 50 per cent	New York
B-1039	11.39 per cent	Not more than 75 per cent	New York
B-1047	13.60 per cent	Not more than 60 per cent	St. Louis
B-1054	15.47 per cent	Not more than 75 per cent	New York

The following conditions were noted in the foregoing samples:

No. B–529 contained thirty per cent. of cut stems. The proportion of pistillate inflorescence was small. The odor was not pronounced or characteristic of Indian Cannabis.

No. B–1034 contained an excess of leaves, stems and seeds. The flowering tops were small.

No. B–1039 contained over fifty per cent. of seeds and stems. The color of the sample was a uniform bright green. No odor of Cannabis was suggested.

No. B–1040 contained only a small proportion of seeds and stems. The drug had been compressed in such a manner as to resemble Indian Cannabis.

No. B–1047 contained a very small proportion of leaves, stems and seeds. The odor was slight and not that of Indian Cannabis.

No. B–1054 consisted of small leaves, leaf fragments, and bracts. No seeds or stems were present.

No. B–824 and No. 1032 were collected from wild plants of Cannabis sativa, and consisted largely of leafy tops. The flower clusters were extremely small, and constituted only a minor portion of the sample.

INFERIOR CANNABIS FROM FOREIGN SOURCES.

That there is much inferior so-called Indian Cannabis on the market is true without doubt. It seems probable that a great deal of this has been grown, not in India, but in other places.

The following table shows the results obtained in testing some of these inferior grades. These samples were received at different times (over a period of two years), and were submitted by drug brokers upon the requests for samples of Indian Cannabis.

No. of Sample.	Marks on package.	Activity compared with good Indian samples.	Commercial Source.
B-275	" Cannabis Indica "	Approximately 70 per cent.	Greece
B-634	" Indian Cannabis, Green Tops "	Approximately 60 per cent.	Germany
B-644	" Cannabis Herb, Madagascar "	Approximately 50 per cent.	Germany
B-660	" Cannabis Indica Herb "	Approximately 40 per cent.	Greece
B-815	" Levant "	Approximately 50 per cent.	New York
B-812	" East Indian Guaza "	Approximately 90 per cent.	London

COMMERCIAL FLUID EXTRACTS OF AMERICAN CANNABIS.

Since the crude American Cannabis upon the market proved to be generally low and variable in activity, it was of interest to know whether or not commercial fluid extracts would show these same qualities. Several samples were purchased in the market and the results of these tests may be seen in the following table:

No. of Sample.	Amount of extractive.	Activity compared with same makers' fluid extracts from Indian grown drug.
P-307	7.40 per cent.	Approximately 90 per cent.
P-308	9.86 per cent.	Approximately 100 per cent.
P-309	6.16 per cent.	Not more than 75 per cent.
P-310	6.37 per cent.	Not more than 50 per cent.
P-311 (African)	15.50 per cent.	Between 90 per cent.-100 per cent.

SUMMARY.

Soil, climate and geographical location have a decided influence upon the activity of American and Indian Cannabis.

Repeated plantings from carefully selected seeds of American and Indian Cannabis have failed to yield a product testing over 65 per cent. as active as good Indian grown drug, while the majority of the plantings tested 50 per cent. and less.

Commercial samples of American Cannabis were found to vary widely in their activity. Of the samples tested none were as active as good samples of the Indian drug, and a number were not more than 50 per cent. as active.

Commercial samples from various foreign sources were supplied upon requests for samples of Cannabis Indica. None of these were equal to the Indian drug and some tested extremely low.

Commercial samples of fluid extracts of American Cannabis vary widely in their activity, some being not more than 50 per cent. as active as Indian fluid extracts from the same makers.

In addition to physical and botanical characteristics, the physiological assay is of greatest importance in judging the quality of the drug. Very little dependence can be placed on the estimation of the extractive matter yielded to alcohol.

The results of this work indicate that if American Cannabis is made official, difficulty will generally be experienced in obtaining highly active lots which will compare favorably with good Indian drug.

From the DEPARTMENT OF BOTANY AND EXPERIMENTAL MEDICINE.

ELI LILLY & COMPANY.

COMMERCIAL CINNAMON AND CASSIA.*

By Harry E. Sindall.

The varieties of cinnamon and cassia on the market are rather numerous, and differ from each other considerably in flavor, strength, ash, volatile oil, alcohol extract, etc. Considering these differences it seems of interest to tabulate the composition of some of the more important varieties as shown by average samples of large lots ground in the commercial way. Among the commonest used are broken China, Ceylon chips, broken Batavia, Saigon and Seychelle cassia. In addition, some data are given on some cinnamons and cassias not so well known. Broken China is Cassia cinnamon,[1] sometimes known as China cassia or Canton cassia, and is cultivated in the southeastern provinces of the Chinese Empire and exported by the way of Calcutta. It occurs in quills usually shorter than those of Saigon. The bark is aromatic, and somewhat astringent. It is imported in large rattan bales, and used extensively in commerce. Ceylon cinnamon is collected from *Cinnamomum zeylaniuum,*[1] indigenous to and cultivated in the island of Ceylon. It comes in closely rolled double quills, composed of numerous thin layers of the inner bark of the shoots. The odor is delicately aromatic, and very distinct from either Cassia or Saigon bark. Ceylon chips consist of the small refuse of the whole bark, and apparently the great amount of dirt present is due to the fact that these pieces are collected off the ground for shipment. Ceylon chips are imported in large and heavy bales packed by a press. Its use in commerce is very limited on account of its dirty condition. Ceylon cinnamon contains from 0.5 to 1 per cent. volatile oil. Batavia cassia is the bark of *Cinnamomum Burmanni*.[1] It occurs in double quills, the larger sometimes enclosing the smaller quills, 5–8 cm. long, outer surface light or reddish brown, nearly smooth, inner surface dark brown with occasional depressed areas, odor and taste aromatic and distinctly mucilaginous. Broken Batavia consists of quills broken in small pieces, and is imported very clean in ordinary bagging and used extensively in commerce. Saigon cassia is obtained from *Cinnamomum Loureirii*,[2] and is cultivated in Cochin China, and parts of China, and exported from Saigon in bundles about 30–40 cm. long, 20 cm. wide, and 10 cm. thick, weighing about 1.5–2 kg., and consisting of pieces varying in size and color from small brownish black single quills to large thick grayish-brown transversely curved pieces. The odor is aromatic, taste mucilaginous, aromatic and pungent. It is used very extensively in commerce, is imported in wooden boxes covered with rattan, and is usually clean. Seychelle cassia comes from the islands of that name in the Indian Ocean. It is a very thick bark, mild in flavor and odor, and exceedingly clean. It is imported in ordinary bagging.

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* Reprinted from the Journal of Industrial and Engineering Chemistry, Vol. 4. No. 8. August, 1912.

[1] Kraemer's "Botany and Pharmacognosy," 2nd Ed., pp. 513-16.

Table I gives the average, maximum, and minimum of total ash and acid insoluble ash, by years, of samples from large lots. The A. O. A. C. methods of analysis were used.

TABLE I.—PERCENTAGES.

		Total ash.			Ash insoluble in HCl.		
Variety	Samples	Max.	Min.	Av.	Max.	Min.	Av.
Year 1908.							
Broken China	(24)	7.47	3.12	4.79	4.17	0.69	2.02
Ceylon chips	(4)	7.60	7.38	7.47	3.80	3.02	3.59
Broken Batavia	(5)	5.00	4.31	4.68	1.71	1.13	1.40
Saigon	(9)	4.52	3.63	4.25	1.52	0.58	1.09
Seychelle	(4)	5.91	3.63	4.70	1.70	0.05	0.90
Year 1909.							
Broken China	(15)	4.26	3.37	3.77	1.53	0.94	1.20
Ceylon chips	(4)	13.41	7.83	10.49	8.16	3.25	5.57
Broken Batavia	(2)	3.96	3.63	3.79	0.19	0.16	0.18
Saigon	(2)	4.36	4.22	4.28	1.71	0.78	1.24
Seychelle	(6)	4.90	3.42	4.40	0.27	0.03	0.11
Year 1910.							
Broken China	(2)	3.97	3.71	3.84	1.27	1.24	1.25
Ceylon chips	(4)	8.39	5.88	7.15	4.18	0.51	2.32
Broken Batavia	(4)	3.90	3.57	3.78	0.34	0.25	0.29
Year 1911.							
Broken China	(14)	3.72	2.78	3.27	1.00	0.50	0.76
Broken Batavia	(7)	5.04	3.57	4.32	0.86	0.21	0.48
Saigon	(6)	4.80	3.71	4.21	0.79	0.43	0.66
Seychelle	(4)	4.80	3.57	4.10	0.61	0.28	0.38

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[2] Kraemer's "Botany and Pharmacognosy," 2nd Ed., pp. 513-16.

As the table shows, prior to 1909, the quality of broken China imported made it a difficult problem for the spice grinders to conform with the maximum total ash and acid insoluble ash standards of six and two per cent., respectively, given in Circular No. 19, Office of the Secretary of Agriculture, because the bales were often full of pebbles and dirt. However, after the Food Inspection Officials had rejected an importation, broken China changed for the better, and unless very cheap material is bought the spice grinder has very little trouble with this variety to-day.

Table II shows analyses of samples of other varieties ground in small lots in the laboratory. The flavors of these samples vary from the mild Seychelle cassia to the strong Saigon. The barks with the exception of the Seychelles and Batavias are dark in color, but vary in thickness and shape. The volatile ether extract on which the strength of the flavor is supposed to depend varies remarkably as also does the crude fibre.

TABLE II.—PERCENTAGES.

Variety.	Total ash.	Water soluble ash.	Ash insoluble in HCl.	Volatile ether ext.	Non-volatile ether ext.	Alcohol ext.	Crude fiber.
Seychelle bark (*a*).........	4.08	2.54	0.29	0.66	1.87	9.16	49.49
Seychelle bark (*b*).........	5.49	2.73	0.07	0.70	1.99	9.72	44.66
Ordinary broken China	3.96	0.91	1.24	0.90	2.91	3.76	24.84
No. 1 broken Saigon	3.77	1.25	0.05	3.39	4.13	7.80	25.29
Extra No. 1 Batavia	2.92	0.71	0.09	2.45	2.95	9.07	13.33
Pakhoi rolls	2.62	0.82	0.33	1.16	2.58	8.86	21.07
Coarse Corintjie	3.14	1.09	0.48	2.23	3.52	5.24	28.16
Regular No. 1 Corintjie	5.97	2.08	0.13	1.33	4.45	6.78	19.04
China rolls	2.85	0.64	0.15	1.64	3.32	7.14	24.73
Good short stock Batavia...	4.10	1.67	0.19	2.49	4.10	9.38	14.08
Kwangsi rolls 3rd..........	3.39	1.45	0.21	2.71	4.45	6.78	18.61

Table III gives analyses of twelve samples of ground cinnamon purchased in retail packages and representing the general character of the cinnamon offered to the consumer in the eastern market.

These samples are blends of the different varieties, and with a few exceptions comply with the standards of Circular No. 19. It would appear that by using ordinary caution in buying and blending, no difficulty should be experienced in complying with the standards

TABLE III.—PERCENTAGES.

Samples.	Total ash.	Water sol. ash.	Ash insol. in HCl.	Volatile ether ext.	Non-volatile ether ext.	Alcohol ext.	Crude fiber.
1	6.90	1.34	2.64	1.44	2.85	10.68	36.88
2	3.37	0.92	0.90	1.83	3.89	6.28	28.88
3	6.88	0.78	2.80	1.68	3.80	6.28	31.14
4	9.35	0.86	6.11	1.81	3.40	6.80	29.10
5	3.44	1.28	0.43	0.67	1.88	7.76	23.40
6	3.50	0.85	1.03	1.58	3.80	8.08	25.06
7	3.53	1.19	0.49	0.93	2.01	7.66	24.30
8	3.88	1.32	0.31	1.03	2.88	6.74	26.96
9	4.75	1.07	1.54	1.40	3.01	7.76	23.34
10	2.52	0.09	0.15	0.79	1.92	8.46	27.16
11	3.50	1.08	0.45	0.72	1.42	6.04	23.74
12	4.15	1.34	0.64	0.63	1.91	7.88	26.49

of Circular No. 19 in regard to total and acid insoluble ash. It must be understood that the spice grinder does not practice blending to work in dirty material, but because blending is necessary to obtain the desired flavor that is demanded by the trade.

LABORATORY WEIKEL & SMITH SPICE CO.,
PHILADELPHIA, PA.

ABSTRACT OF REPORT ON MEDICINAL PLANTS AND DRUGS AT THE LAST ANNUAL MEETING OF THE ASSOCIATION OF THE OFFICIAL AGRICULTURAL CHEMISTS.

By L. F. KEBLER, *Referee.*

During the past year the coöperative work on drug problems in conjunction with the Association of Official Agricultural Chemists has been very satisfactory. The number of coöperators taking part was unusually large and all manifested a spirit of interest in the work. The Referee's report was submitted under the following headings:

1. Methods of Sampling.
2. Methods of Analysis.
3. Inadequate Standards.
4. Results.

It is well recognized that the procuring of representative samples for analytical work is the first important step in securing uniformity of chemical analyses. So long as we are not certain of obtaining samples which represent the total average of the material of a given consignment, we can never rely on the results directly setting forth the quality of the goods handled. In the taking of samples it is necessary to take into consideration the character of the goods to be sampled, the nature of the container, the probable climatic conditions obtaining, and the source of production. Experience covering a number of years shows the difficulty confronting the analyst, and in order to bring about uniform action and ultimately avoiding friction and reassaying, the referee recommended that a committee be appointed to take up the entire subject of drug sampling and report back to the Association at the next annual meeting. It is not unusual to meet with consignments containing hundreds of bales or bags or kegs or pockets or carboys or barrels, etc. The question naturally arising is how many packages shall be sampled in order to obtain material that will fairly represent the commodity under consideration. In the case of ergot, for example, it was found that one bag in ten may be found inferior and it sometimes happens that this one particular bag is selected for sample. The result is that the entire delivery is withheld. On the other hand if one of the other nine bags is sampled, the shipment is released with the result that the inferior package finds its way into the trade. It is exceedingly difficult to sample the bales of a large consigment so as to procure satisfactory results. It has been found that the outside of a bale, for example, will be perfectly satisfactory, whereas, the interior is of an inferior character. The number of bales to be examined is also a difficult matter to determine in every case. For example, one bale of belladonna root will show an alkaloidal content much below that prescribed by the standard, while many other bales of the same consignment comply with the standard. Under these conditions it has been found necessary at times to sample every bale in an entire consignment in order to secure satisfactory results.

Similar questions were discussed in conjunction with gums, resins, oils, products solid at one temperature and liquid at another, semi-solids, balsams, etc.

Methods of Analysis.—In order to arrive at a fair conclusion relative to an article, it is necessary to take into consideration all factors that may throw light upon the subject. The first point that naturally presents itself is the physical appearance of the commodity. If the article is not of normal appearance, suspicion is aroused immediately. The next two factors of great importance are odor and taste. Any one familiar with these two factors of various crude drugs he is liable to meet is fortunate indeed. Much time may often be saved by submitting a given sample to microscopical examination before applying chemical methods. It is often necessary also to resort to mechanical means to determine the amount of foreign material that may be present in a given sample.

Inadequate Standards.—The Pharmacopœial standards for buchu leaves, for example, makes no provision whatever for the presence of any stems or other incidental foreign material which is liable to find its way into the drug at the time of collection. If such a standard were put into force and effect, the amount of this drug imported into the United States would be exceedingly small. In practice it has been found necessary to allow a certain amount of foreign material referred to above. What has been said in connection with buchu leaves also holds for many other leaves. Imitation balsam Peru complying with the test of the Pharmacopœia in every detail has been met with. It is, however, not identical chemically with the natural product, neither has it been shown that its therapeutic properties are the same. The test prescribed by the Pharmacopœia for morphin sulphate permits the presence of a considerable quantity of codein and other alkaloidal bodies derived from opium. In case the chemist is examining a sample of morphin sulphate according to the test prescribed by the Pharmacopœia and it complies in every respect with this test, he must of necessity report it as satisfactory. If this morphin sulphate containing a goodly proportion of codein is now used in the manufacture of morphin sulphate tablets or other mixtures in which the morphin sulphate present is an important part, and the analyst discovers codein, he immediately infers that the original material was contaminated with this alkaloid, or the product is not properly named, or may even be misbranded in view of the fact that the codein is not declared, a condition which might cause some embarrassment.

The standards for the essential oils and the methods for arriving at same are very inadequate, as most analysts know. In fact, there is no difficulty whatever in manipulating some of the oils so as to comply with the standard prescribed in accordance with the methods detailed for arriving at same.

The standard for copaiba also is decidedly inadequate, it is believed, largely for the reason that we know so little about the actual composition of this commodity. In order to eliminate many of the uncertainties it will undoubtedly be necessary to study the article from the source of production to the time of consumption.

Results.—These can best be indicated by giving short résumés of the subjects considered which follow:

H. H. Rusby, Associate Referee on macroscopic and microscopic study of plant drugs, has been working on the subject of providing adequate descriptions for crude plant drugs not available at present. This will necessitate elaborating some of the standards for certain Pharmacopœial drugs.

MEDICATED SOFT DRINKS.

By G. W. Hoover, *Associate Referee.*

The work was confined to the determination of constituents (caffein, cocain, phosphoric acid) and the estimation of the total solids. The coöperative sample was prepared so as to represent as far as possible a number of preparations which have been found upon the market.

The results obtained by a majority of the chemists in the determination of caffein was satisfactory. The figures show that if the method outlined is carefully followed, concordant and accurate results will be secured. The caffein is obtained quite pure without subjecting it to a special method of purification.

The results for cocain were slightly low. The quantity in the preparation, however, compared with caffein, is quite small, and in view of the complex composition of the mixture, the results obtained in the estimation of cocain were also satisfactory.

The method outlined for phosphoric acid is quite lengthy, but the results showed that if it is strictly followed, an accurate determination of this constituent can be made.

The results of the method for the determination of total solids showed too wide a variation. It was found that more concordant results were obtained by using a comparatively small quantity of the sample (2 to 4 grams) than by using a larger quantity, and it is evident that further work upon the determination of total solids is necessary.

REPORT ON HEADACHE MIXTURES.

BY W. O. EMERY, *Associate Referee.*

In the past the coöperative work has had to do with mixtures of the referee's compounding, while that of the year just completed involved commercial products obtained on the market. The preparations were in tablet form. Twenty tablets together with the necessary directions for procedure were furnished each of the dozen co-workers. One mixture sent out contained as active ingredients caffein, and acetphenetidin; another, codein, acetanilid and sodium salicylate; and a third, codein sulphate, antipyrin and acetphenetidin.

In general, the results may be considered very satisfactory in view of the inherent difficulties peculiar to certain preparations involved; more particularly, however, for the reason that probably one-half of the collaborators had not had any previous experience with such work, all of which indicates that the methods submitted are correct in principle and need only to be varied in detail to meet the problems arising from special combinations.

A method was devised in connection with the examination of mixtures containing caffein, acetanilid, quinin and morphin. The separation is based on the solubility of caffein and acetanilid in chloroform, while the sulphates of quinin and morphin are insoluble in this reagent. The alkaloids were separated from each other by virtue of the insolubility of sodium morphinate in the aforesaid solvent, the morphin itself being finally extracted as such with chloroform (carrying a little alcohol) from an aqueous solution containing common salt in excess together with a little ammonium salt.

W. O. Emery and C. D. Wright: A study of aspirin tablets and capsules was undertaken, more especially melting temperature alone and in admixture with salicylic acid in various proportions, and finally the acid values of these compounds.

C. C. LeFebvre investigated the method of determining salol alone as well as in admixture with acetphenetidin, having already succeeded in estimating salol both in separate form and in original tablets by hydrolyzing into phenol and salicylic acid and subsequently titration with a standard bromine solution.

COÖPERATIVE WORK ON THE DETERMINATION OF CAMPHOR.

By E. K. NELSON.

A sample of Spirits of Camphor, prepared carefully according to the Pharmacopœia was submitted to twenty-three analysts for the determination of camphor by the hydroxylamine titration method as outlined in Circular No. 77 of the Bureau of Chemistry. The results reported by nineteen analysts varied from 8.33 per cent. to 9.72 per cent., while four analysts found slightly more camphor than was actually present.

The average of all results reported was 9.02 per cent. or a deficiency of nearly 10 per cent., figured on the camphor actually present. The consensus of opinion as expressed by the various analysts was that the conversion of camphor into oxim was not complete. The method can not, therefore, be recommended for exact work.

THE DETERMINATION OF SMALL QUANTITIES OF PEPSIN IN LIQUIDS.

By V. K. CHESTNUT.

The method used in this work was essentially the Jacobi procedure as modified by Solm. A .4 per cent. solution of U. S. P. pepsin in N/10 hydrochloric acid previously saturated with chloroform was sent out together with some standard pepsin and ricin. The sample was analyzed by seven coöperators. The results reported varied widely. One analyst reported 1 per cent., but the others found between 0.09 and 0.38 per cent. The particularly interesting feature of the results was that the reports seemed to indicate a somewhat uniformly progressive decomposition of the pepsin due perhaps partly to the summer temperature and agitation to which they were subjected or to the action of the chloroform added to the hydrochloric acid to conserve the pepsin against the action of molds. The highest percentage found was obtained at Washington in a sample kept in cold storage and analyzed three days after it was made up. The same sample yielded only 0.2 per cent. 40 days later, and another held at room temperature during the 40 days gave only 0.1 per cent.

ESTIMATING NITROGLYCERIN IN TABLETS.

By A. G. Murray.

Coöperative work on nitroglycerin tablets was carried out on two samples. Nineteen collaborators reported. Considering the rather complicated nature of the methods, the minute quantity of nitroglycerin to be determined, and the lack of experience with the methods of many of the collaborators, the results were as good as could be expected. The completeness of the extraction of nitroglycerin from the tablets should be investigated.

A STUDY OF THE LEAD NUMBER OF ASAFŒTIDA AND ALLIED PRODUCTS.

By N. C. Merrill.

This is a method of measuring the lead precipitate of asafœtida and various other similar products by precipitation of a gram sample of the ether purified resin (dried five hours at 110° C.) by means of a 5 per cent. lead acetate solution in 80 per cent. alcohol. The uncombined lead is determined by filtering off an aliquot portion and determining the lead as sulphate. By carrying a control test the amount of lead combined may be calculated from the difference of the two, and the lead number expressed in terms of milligrams metallic lead per gram of sample.

The following results have been obtained:

Asafœtida 222, galbanum 4, ammoniacum 75, olibanum none, guaiac 171, myrrh 7, colophony 142, bedllium 55, sandarac 251, mastic 34, gamboge 9, dragon's blood 0, euphorbium 34, "pepper asafœtida" 82.

This method gives results which may be checked by independent workers although the value is not absolute on account of incomplete drying of the ether purified resin. It is, however, sufficient to give comparative results.

COÖPERATIVE RESULTS ON MORPHIN ESTIMATION.

By H. E. Buchbinder.

The method studied was that proposed by Eaton. The main features of the method for opium are as follows:

The opium is digested in lime water, the lime water is filtered and an aliquot taken. The latter is shaken out repeatedly with chloroform to remove other alkaloids, then ammonium chloride is added and the morphine is shaken out with a mixture of chloroform and alcohol. The latter is evaporated and the residue titrated with standard acid and standard alkali.

The methods for paregoric and syrup are adaptations of the opium method.

The results of the collaborators showed that in case of powdered opium the conditions prescribed do not insure the complete exhaustion of the powder, also that it is practically impossible to get rid of the other alkaloids by direct extractions. The results on paregoric were decidedly better than those on opium, but were not altogether satisfactory.

ON THE ESTIMATION OF MORPHIN.

A paper by H. E. Buchbinder gave the results of a study of a number of topics having a bearing on certain analytical methods for morphin.

1. *Does chloroform take up morphin from an alkaline (fixed alkali) solution?*—It was found that with a certain excess of alkali the amount taken up is negligible.

2. *Chloroform plus alcohol as a solvent for morphin.*—In this connection the distribution of alcohol between chloroform and water as well as solubility of morphin in chloroformic alcohol and aqueous alcohol, were studied.

3. *Chloroform alone as an extracting solvent.*—Conditions were found under which small quantities of chloroform can be used with great convenience to extract morphin from an aqueous solution. This is made possible by the conversion of the morphin into a form ten times more soluble than the ordinary "crystalline" variety.

4. *The Eaton methods.*—The chief defect is the practical impossibility of removing the other alkaloids from the lime water solution. A "negative" test is misleading.

5. *An error of the U. S. P. method.*—The amount of morphin remaining in the mother liquor was found to be about 140 mgms.

6. *New methods for opium and opiates.*—The salient features are: First, the use of chloroform alone as an extracting solvent for morphin; second, the use of barium salts as precipitants of resinous impurities, thus entirely overcoming the difficulty of emulsions.

The following is a brief outline of the proposed method for powdered opium.

The initial extraction of the powder is effected by digestion with hot water, followed by the addition of 10 per cent. sodium hydroxid and shaking during a short interval. The solution is saturated with salt, diluted with saturated salt solution, and after the addition of barium chlorid, is made up to volume with saturated salt solution. After filtration an aliquot is taken. The latter is acidified with concentrated hydrochloric acid and then rendered ammoniacal with concentrated ammonia, the quantities of the acid and the ammonia being carefully regulated so as to secure certain definite concentrations of free ammonia and ammonium salts. After the addition of some alcohol, the morphin, accompanied by a certain amount of other alkaloids, is extracted with chloroform. A few extractions with very small quantities of a saturated salt solution containing about 2 per cent. of sodium hydroxid, take out all the morphin from the chloroform extract. The almost negligible amount of other alkaloids carried by the alkaline-salt extractions is removed by means of one or more shake-outs with chloroform. The morphin is then re-extracted with chloroform under conditions similar to those in the first extraction with chloroform. After the evaporation of the chloroform, the residue is titrated by means of standard acid and alkali. With experience the entire analysis can be completed within 2½ hours.

Methods are also offered for laudanum, paregoric, etc. These are adaptations of the basic method—that for opium.

A COMPARISON OF VALUES OBTAINED FOR THE REFRACTIVE INDICES OF AQUEOUS SOLUTIONS OF ETHYL AND METHYL ALCOHOLS.

By B. H. St. John.

This paper embodies the comparison of the values obtained by different investigators for the refractive indices of the aqueous solutions of ethyl and methyl alcohols reduced to the same temperature by means of the temperature coefficients given by Doroshevski. The values compared are those of Deville, Wagner, Leach and Lythgoe, and Doroshevski, and Andrews for ethyl alcohol; and of Drude, Wagner, Leach and Lythgoe, and Doroshevski for methyl alcohol.

INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

By M. I. Wilbert, Washington, D. C.

The Fifteenth International Congress on Hygiene and Demography, held in the City of Washington, September 23–28, 1912, was attended by official representatives from 24 of the more important nations of the world. Few, if any, meetings of a distinctly medical character have attracted as wide-spread attention in lay circles, particularly in the daily papers, as this congress and the reason no doubt is that the great mass of the people are beginning to appreciate the value of health and are alive to the truism so frequently heard that "prevention is better than cure."

President Taft, himself a member and the honorary president of the congress, in welcoming the congress to America, called renewed attention to this truism and pointed out that while the science of medicine and surgery had made wonderful progress during the last forty years it would seem as if the science of sanitation, hygiene and preventive medicine had come into being from nothing and had developed with such rapidity and success that we may yet expect to find the fountain of youth and perpetual life sought for by some of the early discoverers of this country.

He also pointed out that there is reason to believe that the present United States Public Health Service will develop into a bureau of research for evolving a rational system of practical hygiene and preventive medicine. The practical results of the work already accomplished in Cuba, Porto Rico, the Philippines, and latterly in the Canal Zone by American sanitarians have so enlarged our knowledge of the possibilities of successful sanitation, under the most burdensome conditions, that the problem of making the tropics habitable for white people appears to be all but solved.

The 300 or more papers included in the official program were discussed in 9 sections and in the joint sessions and plenary sessions that had been arranged. Altogether it may be said that, despite occasional differences of opinion on matters of theory regarding which no definite information is available, the safeguarding of the health of human beings was discussed on broad, practical lines and with a general absence of the hysteria and the unfounded assertions that have all too frequently characterized the statements of many of our self-appointed guardians of the public health.

Because of the comprehensiveness of the program it will be impracticable to call attention to more than the general object of the program of each particular section.

Section I.—Hygienic Microbiology and Parasitology, presided over by Prof. Theobald Smith, Harvard Medical School, devoted itself largely to the discussion of the causative factors of diseases, their study and control.

Section II.—Dietetic Hygiene; Hygienic Physiology, presided over by Prof. Russell H. Chittenden, Scheffield Scientific School, Yale University, presented a very comprehensive program in which the general subjects of nutrition and the relation of food to metabolism and to the general health of man were discussed from practically every point of view. Men of international repute who have made dietetics a specialty took part in the discussions and it is quite probable that never before have so many well-known men taken an active part in a program of this kind. Among the men present were Max Rubner, Berlin; Carl von Norden, Vienna; Axel Holst, Christiana; Archibald B. Macallum, Toronto, and practically all of the leading bromatologists of this country.

Section III.—Hygiene of Infancy and Childhood, presided over by the Nestor of American Medicine, Dr. Abraham Jacobi, was devoted to the discussion of problems of prime importance to future generations of the human race.

Section IV.—Hygiene of Occupation, presided over by Dr. Geo. M. Kober, Prof. of Hygiene, Georgetown University, Washington, was devoted to the discussion of plumbism and other occupational intoxications, and also the diseases and injuries characteristic of different occupations. As a practical result of the discussion on these subjects it was subsequently recommended that notification and returns of occupational diseases be made in a uniform manner by international agreement so that the resulting data would be available and would prove to be useful in the development of the necessary preventive measures.

Section V.—Control of Infectious Diseases, presided over by Dr. Herman M. Biggs, General Medical Director, Department of Health, New York City, discussed various disease carriers and other methods of spreading infectious diseases, the use and abuse of disinfectants and the possible control of different diseases by sanitation and other preventive measures.

Section VI.—State and Municipal Hygiene, presided over by

Dr. Frank F. Wesbrook, Professor of Pathology, University of Minnesota, Minneapolis, discussed, chiefly, the problems of water supply and the disposition of waste products in cities and towns.

Section VII.—Hygiene of Traffic and Transportation, presided over by Dr. Rupert Blue, Surgeon General, United States Public Health Service, Washington, discussed the powers and duties of government in respect to the hygiene of traffic and transportation, the sanitary supervision of common carriers, the protection of their employees and the protection of the public through systematic supervision of employees.

Section VIII.—Military, Naval and Tropical Hygiene, presided over by Medical Director Henry G. Beyer, U. S. Navy, Washington, discussed camp hygiene, general prophylactic measures and vaccines and other means for preventing the spread of infectious diseases.

Section IX.—Demography, presided over by Prof. Walter F. Willcox, President of the American Statistical Association, Cornell University, Ithaca, discussed vital statistics and the importance of demography to the welfare of the human race.

The value of vital statistics for a systematic development of public health work is being more and more appreciated and the work of this section attracted an unusual amount of attention. The further development of this particular branch of the work is outlined by the recommendation of the Congress that in every country statistics of births, deaths, marriages and divorces be published periodically and, if practicable, annually. The importance of such compilations from a sociologic as well as hygienic point of view is evident as no practical advance can be made unless existing conditions are well known and clearly recognized.

Any account of the Congress on Hygiene and Demography would be incomplete without a more or less extended reference to the remarkable "Exhibition on Health" that was developed under the able direction of Dr. J. W. Schereschewsky of the United States Public Health Service. This exhibition was designed to show the public health work of the several states and larger municipalities. The exhibition opened September 10, was continued for three weeks and attracted upwards of 100,000 visitors to the 1,000 or more exhibits in the 13 sections into which the exhibition was divided.

The titles of the several sections give but a meagre suggestion of the wealth of material that had been gathered together as a practical demonstration of the work that is now going on in various lines of public health work and scientific research.

Of special interest to pharmacists were the exhibits made by the Bureau of Chemistry of the Department of Agriculture showing the development of the work in connection with the enforcement of the food and drugs act. The exhibition of deleterious, or otherwise objectionable products made by the drug laboratory of the Bureau of Chemistry was particularly notable and attracted considerable attention.

Another exhibit and one that will have a marked, though perhaps not an immediate, influence on the practice of Pharmacy in America was that made by the American Medical Association. This exhibit was probably the most comprehensive arraignment of so-called " patent " medicines that has ever been made in a popular exhibition and proved to be unusually interesting and attractive to the average attendant at the exhibition. There were probably but few of the many hundreds of exhibits that were more carefully studied by persons who appeared to be interested than the propaganda for reform show of the A. M. A. In consideration of the novelty and of the interesting nature of the exhibit it was given a certificate of superior merit by the Committee on Awards.

The success attending this, the first popular exhibit made by the American Medical Association should serve as an incentive for the officers of the Association to take part in other exhibitions that are designed to promote the general welfare of the public. In this way it would appear to be a comparatively easy task to arouse public opinion and to discourage the advertising of nostrums in the daily and other papers that are at all desirous of supplying the wants and of complying with the opinions of their readers. The discontinuance of advertising in respectable papers would naturally result in the rapid decline of the sale and use of " patent " medicines and, as suggested above, would undoubtedly have a very marked effect on the future development of pharmacy in this country.

The many hundreds of exhibits that were housed in the exhibition hall served to illustrate practically every phase of hygiene and sanitation, from the hygiene of infancy to that of old age and from the supply of water and healthful food to the disposition of waste and the treatment of sewage, and would require volumes fo· an adequate description.

In addition to the exhibition proper there was, in two lecture halls, a succession of demonstrations, with stereopticon slides and moving pictures showing the public health work that is now in progress in various sections of the country.

The general popularity of the exhibition and the accompanying public lectures is well reflected by the proposition, already voiced by many of the daily papers in and around Washington, to develop a permanent exhibition on health and hygiene that could, at least in part, be carried to different sections of the country for the practical instruction of the people in matters relating to hygiene and sanitation.

With such a permanent exhibition as a possibility and with the incentive of the international congress on hygiene and demography actively at work in all sections of our great country we can readily agree with the assertion made by President Taft, in his opening address, that such congresses make for the permanent improvement of the human race, they create a deeper love in man for man, they stir up a greater human sympathy and they assure to the scientific student who is willing to devote his life to the development of truths designed to promote the health and comfort of his fellows a reward that cannot be measured in money but is to be found only in the consciousness of the highest duty well done.

THE SIXTIETH ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

By Joseph W. England.

The sixtieth annual meeting of the American Pharmaceutical Association was held at Denver, August 19th to 24th, 1912, and was one of the busiest of recent years. The number in attendance was over four hundred, representing thirty-eight states. The sessions were numerous; at one time there were five simultaneous sessions. A Section on the U. S. Pharmacopœia and National Formulary was created. A large number of papers were read, discussions were frequent, and interest in the work was general.

Probably, the most important step taken at the meeting was the formation of a House of Delegates. Although of the same name as that of the governing body of the American Medical Association, its functions and duties are radically different. The step is a tentative one; the body may be given larger powers in the future or it may be abolished if it fails to meet the needs of the Association.

Originally, the American Pharmaceutical Association was a delegate-body, delegates being sent by colleges of pharmacy and pharmaceutical organizations to the annual meeting, the thought being that by making the Association an association of delegates, the cities would be encouraged to form local organizations in order to secure representation, but it was decided that such a procedure would tend to make the Association subject to the control of the local organizations and it was abolished, and individual membership became dominant. Strange to say, however, that while the delegate-system as the controlling power of the Association was abolished, the system itself was continued, but with the delegates having no duties to perform. Hence, the attendance of delegates became perfunctory. It is true that many of the delegates exerted, as individual members, an important influence on the councils of the Association, but it was felt, at Denver, that this influence could be widely extended and made potential for the good of the Association, if the delegates were given specific duties.

The membership of the House of Delegates will consist of three regularly elected or appointed delegates from Local Branches of the American Pharmaceutical Association, State and Local Societies, Colleges and Schools of Pharmacy, and delegates from the National Association of Retail Druggists, National Wholesale Druggists' Association, American Medical Association, National Association of Boards of Pharmacy, Women's Organization of the National Association of Retail Druggists, National Association of Manufacturers of Medicinal Products, American Chemical Society, Association of National and State Food and Dairy Departments, Association of Official Agricultural Chemists, and from the departments of the Army, Navy and Public Health and Marine Hospital Service, the American Association of Drug Clerks, the credentials of whom shall all be approved by the Council; together with five members of the Council appointed by the Chairman of the Council. The President, President-elect, Treasurer, General Secretary and the Chairman and Secretary of the Council shall be members ex-officio.

The House of Delegates will exercise the following functions:

1. To receive and consider the reports of delegates from the bodies which they represent in the House of Delegates.

2. To consider and report upon such resolutions, and upon such other subjects as may be referred to the House of Delegates by the Council, by the Sections or by the Association in general session.

3. To make a final report of the business transacted to the final session of the outgoing Council at each annual meeting.

4. It shall have authority to adopt all rules and regulations necessary to the proper conduct of its business and not inconsistent with the Constitution and By-Laws of the Association and the Council.

It should be noted that the House of Delegates can exercise such functions only as have been specified, or may be hereafter specified, by the Council. It cannot *initiate* resolutions, but can consider or redraft only those referred to it by the Association, Sections or Council. It is in effect, a clearing-house where resolutions can be referred and proposals moulded into shape for consideration by the Council—which still remains the executive body of the Association—and which, in turn, reports to the general assembly. In this way, questions can be fully and thoroughly discussed before the House of Delegates, both by delegates and members, and the business of the Association, Sections and Council expedited.

The House of Delegates will be the connecting link between the colleges of pharmacy and pharmaceutical organizations and the Association, so that co-operation and co-ordination of work can be secured. When delegates are appointed to attend meetings of a delegate body they naturally bring with them the wishes of the bodies they represent, and when they return, they carry back the results of their deliberations.

In this way, there can be had closer connection in work and reciprocal action, and the Association can better represent the interests of the whole country and be, in effect, what it should be, a more truly national organization.

The address of President J. G. Godding was suggestive and practical, embracing such subjects as the National Formulary of the American Pharmaceutical Association, Pharmaceutical Syllabus, American Pharmaceutical Association Recipe Book, National Association of Retail Druggists, State Associations, Membership, International Congress of Pharmacy, Pharmacists in the Government Service, Conference of Food and Drug Chemists, Drug Reform, Local Branches, Prerequisite Laws and Business of the Association, etc.

The report of Treasurer H. M. Whelpley was exceedingly satisfactory. With the exception of about a dozen delinquent members, all the members of the Association are in good standing. The assets of the Association amount to over fifty thousand dollars.

The report of J. H. Beal, General Secretary and Editor of the Journal, showed a very satisfactory condition of the affairs under the direction of General Secretary and Editor, and augurs well for the future of the Association.

W. S. Richardson presented a report for the Committee on National Legislation reciting the work of the committee during the past year, and detailing the admirable legislative work done at Washington during the past session of the Congress.

The addresses of the chairmen of the different sections were of an unusually high type.

Chairman P. Henry Utech, of the Section on Pharmacy and Chemistry, submitted some very practical considerations upon the origin, growth and development of pharmacy, its uplifting agencies, its commercialism, and its model conditions.

Chairman John C. Wallace, of the Section on Education and Legislation, presented a characteristically strong address upon the subject of the endorsement of state drug laws, legislative standards, educational requirements, proposed pharmacy laws and the establishment of a National Legislative Conference, in which he gave the section the benefit of his extended and valuable experience in pharmaceutical legislation.

Chairman Ernest Berger in his annual address dwelt most strongly upon the importance of the Section on Commercial Interests to the American Pharmaceutical Association and the necessity for expanding the work of the Section.

In the absence of the chairman and secretary of the Section on Scientific Papers, F. R. Eldred, associate member of the committee, presided as Chairman, and F. P. Stroup acted as Secretary. A number of valuable papers were presented on drug reform, drug market, physiological testing and drug standards. The papers upon standards for identity, purity and strength of drugs were much in evidence.

The paper of Dr. H. H. Rusby on "The Legal Aspects of the Pharmacopœia" elicited especial attention, his recommendations dealing with standards of both the U. S. P. and N. F.

Chairman Otto Raubenheimer of the Historical Section presented a valuable review of pharmaceutical history with his usual wealth of detail.

Edward Kremers, Historian, resigned, and the Council elected Caswell A. Mayo to succeed him.

The papers presented by the Historical Section covered a wide range of subject matter and elicited much discussion.

A joint meeting of the Committees on U. S. Pharmacopœia and National Formulary was an exceedingly interesting one. L. D. Havenhill acted as Chairman, and E. Fullerton Cook as Secretary.

The importance of the U. S. Pharmacopœia and National Formulary in their relation to the Food and Drugs Act has made it necessary for the revision of these works to proceed with much caution and it was felt that a Section on the U. S. Pharmacopœia and National Formulary had now become a necessity in the work of the Association. Later, the proposition to create a Section on U. S. Pharmacopœia and National Formulary was considered by the Council and approved.

At the final general session the Association expressed the opinion that final action with reference to any matters connected with the Pharmaceutical Syllabus shall occur only in a regular meeting of the committee of twenty-one.

It will be interesting to know that a Women's Section of the American Pharmaceutical Association has been created and this is expected to increase the interest of the "silent partners" who attend the annual meetings.

The interest in the work of the American Conference of Pharmaceutical Faculties was pronounced, especially in the subject of standardizing the courses of instruction. One of the most important papers presented was the report of the Committee on Pharmaceutical Degrees outlining certain requirements for the several degrees of pharmacy. Action on this was postponed.

The report of the Committee on Pharmaceutical Syllabus was presented also. The Conference decided that final action on matters relating to the Pharmaceutical Syllabus be taken only at the regular meeting of the committee of twenty-one, and that nothing be definitely decided by correspondence.

The National Association of Boards of Pharmacy includes in its members forty state boards, and its President, R. H. Walker, presided in a most able manner. Probably the greatest share of the discussion was upon the subject of reciprocal recognition of registration to practice pharmacy. The Association decided to issue a guaranty which would entitle the holder to registration without examination by any of the state boards of pharmacy having membership in the National Association, without being required to show further proof that his original registration was obtained under conditions meeting the requirements of the Association. This certificate will be issued to any person registered by any board having membership in the Association, on the payment of $5.

Another certificate proposed was one that would be accepted as registration by the affiliated state boards. This one was to cost $25.

A suggestion that graduation in pharmacy be made pre-requisite to reciprocal registration was approved.

Professor W. B. Day, the new President, is a professor and Secretary of the University of Illinois School of Pharmacy (Chicago College of Pharmacy), and for several years past has been the very efficient Chairman of the Committee on Membership of the American Pharmaceutical Association. His election to the Presidency of the Association is well deserved.

The officers elected for the year 1912–1913 are as follows:

President, W. B. Day, Chicago; First Vice-President, Chas. M. Ford, Denver; Second Vice-President, Caswell A. Mayo, New York; Third Vice-President, C. Herbert Packard, Boston; Secretary, J. H. Beal, Scio, Ohio; Treasurer, H. M. Whelpley, St. Louis; Reporter on the Progress of Pharmacy, C. Lewis Diehl, Louisville.

House of Delegates—Chairman, W. C. Anderson, Brooklyn; Vice-Chairman, C. M. Snow, Chicago; W. S. Richardson, Washington; Secretary, Miss Clarissa M. Roehr, San Francisco.

Section on Scientific Papers—Chairman, F. R. Eldred, Indianapolis; Secretary, F. P. Stroup, Philadelphia; Associates, J. M. Francis and W. L. Scoville, Detroit.

Section on Education and Legislation—Chairman, W. J. Teeters, Iowa City, Ia.; Secretary, F. H. Freericks, Cincinnati; Associates, Miss Zada M. Cooper, Iowa City, Ia.; Hugh Craig, New York; Louis Emanuel, Pittsburgh.

Section on Practical Pharmacy and Dispensing—Chairman, L. A. Seltzer, Detroit; Secretary, F. W. Nitardy, Denver; Associate, Cornelius Osseward, Seattle.

Section on Commercial Interests—Chairman, A. V. Pease, Fairbury, Neb.; Secretary, W. R. White, Nashville, Tenn.; Associates,

H. C. Shuptrine, Savannah; G. C. Kendall, Meridian, Miss; W. H. McCutcheon, Luther, Okla.

Section on Historical Pharmacy—Chairman, J. G. Godding, Boston; Secretary, F. T. Gordon, Philadelphia; Historian, Caswell A. Mayo, New York.

Section on U. S. Pharmacopœia and National Formulary—Chairman, L. D. Havenhill, Lawrence, Kan.; Secretary, E. Fullerton Cook, Philadelphia.

Officers of the Council for 1912–1913—Chairman, E. G. Eberle, Dallas; Vice-Chairman, F. C. Godbold, New Orleans; Secretary, J. W. England, Philadelphia. New members of the Council: W. C. Alpers, New York; F. C. Godbold, New Orleans; L. E. Sayre, Lawrence, Kan.

American Conference of Pharmaceutical Faculties—President, Prof. A. H. Clark, Chicago; Vice-President, Prof. Albert Schneider, San Francisco; Secretary and Treasurer, Prof. C. W. Johnson, Seattle; new members of the Executive Committee: Profs. C. E. Vanderkleed, Philadelphia, and C. E. Caspari, St. Louis.

National Association of Boards of Pharmacy—President, William Mittelbach, Boonville, Mo.; Vice-Presidents, I. P. Gammon, Boston; H. C. Shuptrine, Savannah, and Miss Kittie W. Harbord, Salem, Ore.; Secretary, A. F. Sala, Winchester, Ind.; and member of Executive Committee, J. C. Burton, Stroud, Okla.

The City of Denver was most generous in its hospitality. The Local Committee spared no effort to see that every one had a most enjoyable time. With trolley trips to the foothills of the Rockies, with a matinee, with a visit to the Wilmore Dahlia Farm, and particularly with the trip to Glacier Lake, and Boulder, which has an altitude of 9,600 feet, and is reached after a four hours' trip by rail from Denver over a road that zigzags its way along the edge of the valleys that have made the name of Boulder famous. At the lake luncheon was served. On the return trip, the party, numbering almost 450, stopped at the City of Boulder, where the University of Colorado and the mountain-side park system were inspected, and refreshments and music were enjoyed.

PHARMACEUTICAL MEETING.

The April Pharmaceutical meeting was held on April 12, 1912, Mr. E. M. Boring presiding. Mr. Miers Busch, a trustee of the College and a member of the firm of Shoemaker & Busch, gave a very interesting talk on

"RUBBER AS IT CONCERNS THE RETAIL DRUGGIST."

Mr. Busch said there was not time to take up the subject of the cultivation of the trees, or the gathering of the crude material from wild grown plants, it is sufficient to state that crude rubber of various kinds is gathered in many parts of the world.

That known as "Up-River Para" is regarded as the best, and at the same time is the standard of comparison by which the prices of other varieties are fixed. On account of the large demand during the last few years, it has paid to instruct the native gatherers of wild rubber how to use more care in gathering it and preparing it for the market, with the result of making Ceylon and African rubber more available as a substitute for Para.

A recent Consular report on the World's Rubber Trade gives the following statstics for 1911: Total exports from the Amazon Basin, 79,250,000 pounds, of which the United States received 35,500,000 pounds, Europe 43,250,000 pounds, some of the latter being reshipped to the United States. The Federated Malay States exported of cultivated rubber during 1911, 19,636,000 pounds, an increase over 1910 of 7,500,000 pounds. The value of the India rubber imported into the United States during 1911 was $74,500,000, of which $25,500,000 came from Brazil and $23,500,000 from the United Kingdom; apparently the East India shipments amounted to only $5,500,000.

"Druggists' Sundries" were for years apparently made by all factories from good Para stock, but when the advance occurred, which, roughly speaking, increased the price from 85 cents to $2.50 per pound, strong efforts were made to introduce other kinds, often with disastrous results to the goods furnished.

Until recently, apparently little attention was given to the chemistry of rubber—that is, while every large steel plant has a well equipped laboratory, working with the crude materials purchased, and sending down exact instructions how to combine them so as to standardize the product, a rubber factory depends largely upon the selection of crude materials by the buyer, and upon the skill of the "compounder" in working it up. The "compounder," let me say here, is the highest paid man in the factory, and his methods are personal rather than trade secrets, and are rarely divulged even to others in the same plant.

I hear that Buchtel College, at the suggestion of the Akron factories, has provided a course of training in the examination and testing of crude rubber. I have not been able to learn whether any students have been graduated or what the practical results.

One New York factory engaged, I hear, two expert chemists who, working separately, produced very different results from the examination of samples taken from the same lumps of rubber, so the firm went on in the former way. All this leads to the following summary of conditions:

1. Most of the crude rubber is gathered by comparatively ignorant persons.

2. It is prepared by them without much supervision.

3. It is packed in cases without much grading, excepting that the contents of the case is probably from the same district.

4. It is sold in large lots, of a number of cases.

5. It is then worked up in various combinations, as the cases may be opened.

6. It is then put through a manufacturing process during which it is liable to destruction many times.

Under such conditions we should admire the skill of the men who can place before us goods that look so well and will stand such hard usage.

People seem to think that articles made of rubber are indestructible; in reality they are nearly as fragile as glass bottles, but, like glass, will last a long time if properly cared for.

Crude rubber shrinks steadily, and the loss of weight from time of casing until put into the washers may be as much as 20 per cent. This loss is borne by the holder, as he is paid only for actual weight at the time of delivery. When washed and dried, which process causes additional loss of weight, the manufacturer knows for the first time what the stock actually stands him. Starting from this stage, the rubber is made up to meet the wants of the retail druggist, and at the outset keep in mind that it is made up in five radically different ways, and that the troubles of which many people complain are caused by the selection of the wrong kind of goods.

These classes are as follows:

1. *Pure Gum.*—Goods requiring either elasticity, as rubber bandages, surgeons' bandages, rubber dam, etc., or where the use of other ingredients would be objectionable, as in laboratory stoppers, pure gum tubing, etc. Such goods are made from simply pure rubber of one kind, washed, dried, and rolled with powdered sulphur sprinkled over it before curing, coloring added if desired.

2. *Dipped goods,* made by dipping china forms into a solution of rubber, the process being continued until the desired thickness is obtained. The solution often contains a mixture of two or more kinds of rubber, besides coloring matter and possibly other ingredients, so that while some dipped goods, such as surgeons' gloves and finger cots, are to a certain extent elastic, the rest, such as water bottles, are simply flexible.

3. *Cloth inserted or cloth lined.* A class in which the rubber coating, either spread upon a fabric or rolled into it so as to be partly incorporated, is used to make the fabric air or water tight and at the same time secure flexibility, such as air cushions, rubber sheeting, etc.

4. An especially fine compound used for catheters, rectal tubes, etc., the quality and process of manufacture differing greatly from that of other lines.

5. *Compound goods,* broadly speaking, those with which the public is most familiar. To-day almost the entire line of druggists' sundries is offered in these five lines, some factories confining themselves to one or two types, others making all.

While the goods produced by these various methods are to a degree satisfactory for the use intended, each has its advantages and limitations, the result being " talking points " for the salesman, and a wide range of points for the purchaser.

Moulded goods which are rapidly increasing in use and favor are simply " compounds " cured in iron moulds, which method avoids seams and binding strips, besides producing goods of attractive appearance and effecting a saving in the cost. Compound goods consist of pure rubber mixed with whiting, zinc oxide, scrap rubber of one of a dozen grades, and of various ingredients that will produce certain colors after the goods are cured. As this compound is a mechanical mixture of rubber and materials, neither flexible nor elastic, the result of stretching is merely to separate the rubber skeleton, as it were, and allow the other materials to fall out. A good "compound" in my judgment still produces from a mechanical point of view the best goods and those that last the longest. Pure gum-dipped goods and the poor "compounds" spoil most quickly. Thick stock or heavy weight goods must not always be accepted as of superior quality. The manufacturer may run a low grade stock and depend upon thickness for safety and appearance for sale. One factory makes "compound goods" that appear hard when first received, and the surface has a crystalline appearance, yet I have seen such goods in my stock for about six months sent out without receiving a single complaint or return. Probably when the bottles made of this material are filled with warm water they become flexible and last well.

Much curious information may be obtained from salesmen who know little of the business, and if you have time you may enjoy the entertainment they afford. For instance, by standing on partly filled water bottles, stretching "compound" water bottles and tubing, showing fountain syringes with large tubing and small outlets, sawing soft wood with dressing combs, absolutely guaranteeing 50 per cent. plaid, screw-cap, ice bags, etc. Common sense, of course, will tell you that goods are made with a view to their intended use, and that such demonstrations prove nothing.

Let us consider for a few moments the subject of "compound goods," taking the water bottle as an illustration. After goods are made up they are subject to the curing process, and here I wish to impress upon you the following very important point: this curing is similar to baking a loaf of bread in that it changes entirely the character of the dough, but, on the other hand, it is at the same time a process of destruction. To illustrate: suppose that the life of a water bottle from the time it is finished, but not cured, until it becomes hard and useless, be represented by the length of a yard stick, 36 inches. The curing uses up 5 inches, the time in the factory or jobbing house consumes 5 inches, the time in retail store constricts it 6 inches, so that there is left for the consumer 20 inches. If the bottle be overcured, 12 or even 18 inches of the life of the bottle may have been used up, the difference in length of wear is lost to the consumer, as the time limit remains the same. Overcuring is, however, the rarest trouble and may be considered last. From the moment the bottle is made the process of destruction goes on; if kept in a comparatively tight box away from air currents the chances of preservation are greatly improved.

When water bottles were packed in square boxes, which necessitated a fold in the bottle and were kept in a very cold room, it sometimes happened that when an attempt was made to straighten out the bottle quickly it cracked in two. Factories to-day, as a rule, pack all bottles flat, and some use paraffin paper to wrap goods before placing in boxes.

Experiments are constantly being made with varnish-like preparations that can be applied to the outside of such goods to protect them from the action of the air, at least while in the hands of the dealers. When a box is opened for display trouble begins. You will soon find that the exposed side of a water bottle is becoming hard. If subjected to heat from a stove or radiator, or to the light of an arc light or sun light, or worse than all, if placed in a show case with light *in side,* the process of destruction goes on more rapidly, and the retailer finding the bottle hard makes a claim upon the jobber or factory on account of damaged goods, and feels that he has just grounds for complaint if exchange is not made. You say, "I must display goods to sell them. What am I to do about such articles?" Under ideal conditions they should be kept in closed boxes, and they are displayed at your own risk. However, if you have a half dozen bottles of the same kind, open the top box and when a sale is made deliver that to the customer.

Now, continuing the use of the water bottle as a general illustration, let us consider the troubles the retailer has with his customers, remembering that most bottles are made from "compounds" and were not intended to stretch, neither is there any grain or fibre, the material will tear in any direction with practically no effort, but only after a break is made, so the bindings and neck reinforcements are intended to prevent a break being started. You cannot repair a torn or damaged bag, as you have neither the materials nor tools; moreover, the new work must be vulcanized and that process would complete the destruction of the old portion of the bottle. A bottle may be brought to you distended greatly, so that its capacity has been greatly increased; it is also darkened in color, and you are told that it leaks. Of course it does, it having been filled with boiling water. It will stand such treatment a comparatively short time. If grease, oil, or glycerin has come in contact with the rubber, you will find the stock disintegrating. If the seams are open and the bottle does show the effects of boiling water, ask if it has been in use continuously for several days. Constant heat finally softens the cement and the seams open. In such cases two bottles are required, giving each time to cool and dry. Often claims are made when bottles are really worn out. In all these cases you must summon up courage and tact to explain the situation to the customer. The customer will think " He must have known that it was a poor bottle or he would not have adjusted the claim so promptly." The issue should be fairly met, and, I believe, can usually be settled without loss of trade.

Atomizers.—Most of the trouble with these goods comes from inexperienced people trying to fix them. In my opinion, glass makes the ideal tube, but is fragile. Hard rubber comes next, and appears to stand all solutions used as sprays. Metal tubes I am opposed to, as many solutions act on them. The construction of an atomizer bulb is important. If the stock is too heavy, it is too much of an effort to compress the bulb; if too light, the bulb collapses. A quick-acting bulb is required to produce a continuous spray, and the end valve must be calculated to admit air with sufficient rapidity to fill the bulb as it expands. A new atomizer, filled and used daily, can be kept going indefinitely, but if allowed to stand for a week at a time the solution may clog it. To free it first try hot water, either by putting the entire top in it for a time or by spraying it through the tube, and, as a final resort, the wire should be pushed into the end of the tube that goes into the bottle to avoid injury to the spray point.

I notice that physicians with large practices use atomizers with long tubes and ordinary straight tips. I am of the opinion that extra tips and special shaped tubes, as far as the general public is concerned, are chiefly useful to talk about and sell.

Rubber Gloves.—These are elastic and seamless, and may be roughly divided into two kinds, for the use of surgeons and to be used in the household. Surgeons' gloves are rather satisfactory articles for a druggist to sell; each pair is usually packed in a heavy box with deep telescope lid, and when kept boxed will remain in good condition a long time. They are made from pure gum stock and are usually used but once. They stand the single process of sterilization, and there are seldom any claims for tears or imperfections. With household gloves it is another story. They are made of a " compound." The consumer buys a size too small and the gloves split between the thumb and forefinger. Or, if the hands are moist, forgetting to dust the hands with talcum, the consumer pulls the glove by the wrist until it tears, or removes the glove by pulling instead of turning it inside out and then wonders why the finger tips pull off. Plunged into soapy water and not well rinsed, the stock disintegrates. Touching the blade of a knife, especially under water, cuts it instantly. Anyhow, back comes the consumer for another pair. I often wonder how much it is going to cost before the public is educated.

Ice Bags.—The screw-cap ice bag is the kind in general use to-day, as there is less leakage. Of all druggists' rubber goods, ice bags are subject to the roughest usage, and most frequently returned for exchange, chiefly the result of endeavoring to make them thin, as heavy material impairs their efficiency. There is no difficulty in supplying a screw-capped ice bag to retail at 75 cents to $1, as there are plenty of all-rubber, cloth-inserted or double-coated goods of these values, but the chief difficulty is in trying to find a satisfactory article to sell at 50 cents. Most of the goods of this latter style are made of thin plaid cloth with rubber on the inside only. They must be used with great care. Tell your customers not to attempt to break ice in the bag; also, to avoid sharp cornered pieces that may cut it. A little water poured into the bag will greatly aid in preventing the ice from cutting it.

Nipples.—There are probably fifty styles selling in this market, but many of them are sold so slowly that the stock ages in the hands of the dealers, especially when carried in bulk in a drawer or basket, and thus exposed to the air. It has often impressed me that unless the retailer buys with care and gives special attention to these goods that the losses will equal a considerable portion of his profits. These goods belong to both the " dipped " and " compound " classes, and show very different results under the same treatment. Their lasting qualities depend entirely upon the care which they receive, as, if not perfectly cleaned, the milk will soon destroy them. They cannot be thoroughly cleaned in cold water, and boiling water destroys the rubber.

Rubber Tubing.—One of the most difficult problems that a jobber has to meet is filling orders for rubber tubing. For years I have instructed our salesmen to obtain a small sample of the goods required or to ask exact measurements, and especially to find out the use for which it is intended. Tubing is generally made in lengths of 50 feet, and when cut is not returnable. In placing an order for tubing the following information may be required: intended use, color, inside diameter, thickness of wall, outside finish. This last may be plain, corrugated, or covered with muslin (the latter is known as hand made). A small sample and knowledge of intended use will often save a page of explanation, also whether "compound" goods or pure gum is desired. For example, on atomizers the short piece that joins the bulb to the top is made of moderate diameter and a very heavy wall. For fountain syringes, a rather light wall is used to secure greater flexibility and partly to keep down the cost, as tubing is sold by the pound. Then there are a number of special classes for which compound goods are useless, among them being surgical drainage tubing, which comes in some twenty-five sizes, and is made either of pure gum or a specially fine maroon compound, and can be obtained either plain or perforated. *Gas tubing,* made on a wire coil, covered with fabric and rubber and an outer wearing fabric. This is sold in standard lengths, each end fitted with a heavy soft rubber coupler that makes a gas tight joint. Without going further into this question I trust you will realize the trials of the seller of tubing and by keeping them in mind save yourself time, irritation, and loss.

Fountain Syringes, made of "compound," cloth inserted or dipped stock, are identical in material and construction with water bottles of similar stocks, and there is no reason for the many styles made, except to furnish a range of prices and variety in appearance.

Hard Rubber is on account of its special properties in great demand in many trades. In the "druggists' sundries" business it is chiefly used for combs, atomizer tubes, syringe pipes, and some fittings. Its chief defect consists in its brittleness, but it possesses many advantages. It is easily worked before vulcanizing, and a smooth surface and high polish can be given it at comparatively small cost.

Just here let me call your attention to one of the annoyances of the retail dealer. There are a number of factories making hard rubber syringe pipes, some with screw threads from several lines of moulds. Now, there is apparently no standard for these screw threads, and pipes from different factories are frequently not interchangeable. A pipe may be screwed up with ease about half the proper distance, and then the next turn destroys the thread. Many manufacturers of soft rubber goods buy their hard rubber pipes from various sources, so it is advisable to see that the stock does not become mixed, especially when show cases are cleaned. I do not wish you to think that the rubber line is simply a source of trouble. I have not found it so, but I understood that I was expected to tell you what you have to contend with in buying and selling such goods. In ordinary course of business they are bought, displayed, and sold with little or no trouble. Between the beginning of November and the end of January of this year I have sent out thirty gross of one number of water bottles. Up to the present time less than thirty pieces have been returned. Several of these show signs of boiling. I suggest to the retailer the plan of buying an assorted stock of goods made by several factories, and always with the name of the manufacturer on the goods or box. I think this is better merchandizing than purchasing all goods from one factory or goods from several, but concealed under the label of a jobbing house.

Don't overstock. It may be profitable to buy some goods in quantities sometimes, but in these days the difference in cost between the best price you could obtain and that which you would ordinarily pay is not over 10 per cent., and unless the entire lot is sold promptly, or if 10 per cent. of the stock is left to spoil by age, you are worse off than if you had paid the long price for your actual requirements.

You must, therefore, accept goods as they are shown you, select by appearance numbers best adapted to your trade, take care of your stock, for in that lies the profit. Charge enough to cover the occasional unavoidable loss, and then you will find this department of your business will pay a " reasonable " profit.

C. B. Lowe.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE SEMI-ANNUAL MEETING.

The Semi-Annual Meeting of the Philadelphia College of Pharmacy was held September 30th, 1912, at 4 P.M. in the Library. The President, Howard B. French, occupied the Chair. In the absence of the Secretary, Professor F. P. Stroup acted as Secretary. Twenty members were present. The minutes of the quarterly meeting held June 24th, were read and approved. The minutes of the Board of Trustees for June 4th and 11th were read by the Registrar, J. S. Beetem, and approved.

The report of the Committee on Nominations was read and filed. In the absence of the Chairman, Professor Joseph P. Remington, Mr. Joseph W. England made a verbal report of the meeting of the American Pharmaceutical Association held at Denver. The Chair announced the death on September 20th, 1912, of Dr. Henry Mueller, a life member of the College, and a brief biographical sketch of him was also read.

Professor Henry Kraemer presented the Professor John M. Maisch's copies of the data sent to members of the U. S. P. Revision Committee, 1880 to 1890, by Chairman Charles Rice. He also presented a lot of pamphlets once the property of Professor Maisch. On motion, the thanks of the College was tendered to Professor Kraemer, and the pharmacopœial matter was referred to the Library Committee for proper binding.

Election of three trustees: Messrs. England and Watson were appointed tellers. Mr. Otto Kraus withdrew his name as a candidate. A ballot was taken, and the tellers reported the re-election of Aubrey H. Weightman, William E. Lee, and O. W. Osterlund as trustees for the ensuing three years.

The President appointed the Committee on Membership for the ensuing year.

The names of three candidates were proposed for Associate Membership. Under the rules these were referred to the Committees on Membership to be reported on at the next meeting of the College.

Professor Kraemer suggested the appointment of delegates to the annual meeting of the Delaware Pharmaceutical Association. The Chair appointed Professor C. B. Lowe, A. W. Miller, M.D., and H. J. Watson.

Mr. J. S. Beetem suggested sending congratulations to Mr. Frederick Gutekunst, a graduate of the College, the occasion being the 81st anniversary of his birth and the 50th of his career as a photographer. Professor Kraemer suggested sending notice of action to newspapers. The Chair appointed Professor C. B. Lowe, Professor Henry Kraemer and Professor S. P. Sadtler a Committee to frame a suitable letter. The Committee subsequently presented the following:

At the semi-annual meeting of the Philadelphia College of Pharmacy, held Monday, September 30th, the following resolution was adopted:

The College extends its hearty congratulations to its eminent Alumnus, Mr. Frederick Gutekunst, class of 1853, upon the attainment of 81 years of a most useful life and upon his great success in the profession of photography. His name is now recognized as one of the most eminent in this branch of applied science, and is known both in our own land and to visitors from foreign countries.

C. A. WEIDEMANN, M.D., *Recording Secretary.*

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

June 4th, 1912.—Owing to the absence from the city of a number of the members of the Board of Trustees, the meeting was adjourned until June 11th.

June 11th, 1912.—Fourteen members were present. Minutes of the meetings held May 7th and May 14th were read, corrected and approved.

Committee on Instruction reported the resignation of Mr. John J. Bridgeman, Assistant in Pharmacognosy, to take effect June 1st, 1912, and the appointment of Mr. Philip F. Fackenthall, as Temporary Assistant. Mr. Armin K. Lobeck was re-elected Assistant in Botany for 1 year from June 1st, 1912.

Committee on Commencement recommended that the usual resolutions of thanks be conveyed to those taking part in the Commencement exercises, and that a vote of thanks be conveyed to the Philadelphia Electric Company for the use of fans on that occasion. It was so ordered. They also recommended that the Treasurer be authorized to lease the Academy of Music for Thursday evening, May 22d, 1913; it was so ordered.

Committee on Scholarships presented a very complete report, consideration of which was postponed until September meeting, with the exception of the recommendation referring to the Keasbey & Mattison Scholarship and the Thomas H. Powers Scholarship, which on motion, were continued in force as heretofore, of which action the donors were to be so advised.

Committee on Membership reported favorably on the application of William A. Carpenter for active membership, a ballot was taken and the applicant was unanimously elected.

On motion, it was ordered that the Treasurer be authorized to pay salaries and approve bills during the summer recess of the Board.

September 3d.—Ten members were present. The Minutes of the meeting held June 11th were read and approved.

Special Committee to formulate New Rules submitted a number of suggestions relative to this subject, and after a modification of some of the wording used in the report presented, it was adopted —but referred back to the Committee to make the necessary changes.

Committee on Library reported that very little work had been done during the summer. There were no purchases but a number of donations had been received.

Committee on Examinations reported that Mr. LeRoy Forman and Mr. Glenn E. Jeliff had passed their examination for the Certificate of Proficiency in Chemistry and that Mr. George Rodney Foss and Mr. Richard I. Grantham had passed their examination in the Pure Foods and Drug Course and were entitled to Certificates. On motion, it was ordered that the Certificates be granted.

ICHTHYOL TESTS.

Ichthyol Tests.—In the "*Chemist and Druggist,*" Dec. 18, 1909, Dr. F. W. Passmore, writing in regard to organic sulphur preparations of the ichthyol type, stated that the combined sulphur is the most important constituent in these preparations, and he gave analytical figures which show that ichthyol is distinguished from its substitutes by containing 12.5 per cent. of "sulphidic" sulphur in the organic dry residue, and 6.1 per cent. of sulphonic sulphur, while the composition as a whole is remarkably constant. His conclusions have been confirmed generally by Dr. Aufrecht ("*Allgem. Mediz. Central-Zeit.,*" 1912, 69), who gives analyses of ichthyol and ichthynat, showing that these substances in the natural state contain 10.6 and 7.3 per cent. of sulphur respectively, and when dried the following results were obtained (less dry ammonium sulphate in the residue):

	Ichthynat. Per cent.	Ichthyol Per cent.
Sulphur total	12.29	19.59
Sulphonic	6.59	5.60
Sulphidic	5.70	13.99
Ammonia	3.50	2.98
Ethereal extract	14.55	31.08
Substances insoluble in alcohol	12.99	44.15

THE AMERICAN
JOURNAL OF PHARMACY

DECEMBER, 1912

THE CONSTITUENTS OF LICORICE ROOT AND OF LICORICE EXTRACT. PART I.

By Percy A. Houseman, Ph.D., F.I.C.

The literature of licorice root and extract is a voluminous one, in spite of which, our knowledge of the constituents of the root and the juice, and of methods for their quantitative examination is very incomplete; so incomplete that it is often impossible to state with certainty whether or not a sample of extract is adulterated, unless the adulteration is either gross or crudely performed.

The most valuable contributions to our knowledge of licorice have been made by Tschirch and his co-workers. Other recent authors have made, for the most part, only unimportant modifications of methods of analysis proposed by the earlier investigators,—Diehl, Habermann, Py, Hafner and others. The earlier methods of analysis for licorice extract are largely embodied in that published by Parry,[1] and received by him through the courtesy of the MacAndrews & Forbes Company, which has for more than twenty years used the method reproduced by Parry. This method has been found as satisfactory for commercial use as any other method proposed, but is capable of much improvement—chiefly in two directions.

1. The determination of the *true* glycyrrhizin instead of the so-called "crude" glycyrrhizin, which possesses varying and unknown degrees of crudeness.
2. The inclusion in the analysis, of some of the undesirable

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[1] *Chemist and Druggist*, Jan., 1910.

> constituents of licorice extract, notably of bitter substances and of resins, thereby lessening the item of "Extractive and coloring matter" which is at present used to make the analytical figures add up to 100.

I give a summary of the method of analysis for licorice extract now used by me, before proceeding to a discussion of the recent papers of Tschirch, Eriksson and others.

Moisture and Ash are determined in the usual manner.

Matters insoluble in cold water.—Two grams of the extract are spread on the sides of a small, copper gauze basket, which is placed in a 100 c.c. cylindrical glass tube drawn out to a conical end and containing about 75 c.c. of distilled water. The tube is closed with a rubber stopper and agitated in a shaking machine until the paste is completely disintegrated (½ hour to 1 hour) and then whirled in a Babcock centrifuge for 15 minutes at 1000 revolutions per minute. The clear liquor is poured off and the sediment stirred up with fresh water and whirled for a further 15 minutes. After pouring off the liquor, the sediment is washed into a tared glass dish, evaporated and weighed.

Most licorice pastes, when freshly made, will contain not more than 3 per cent. by weight of matters insoluble in cold water, unless made from very starchy root or from liquor which, having been partly chilled, contains gelatinized starch. A paste containing more than this amount should be dissolved without the aid of a shaking machine by suspending in cold water, as the use of the shaking machine is found to give low results with pastes containing much insoluble matter. Many experiments have shown that 15 minutes is a sufficient time to centrifuge at 1000 revolutions, the results being identical with those obtained by 24 hours settling in a tall jar.

Matters insoluble in hot water.—This estimation is carried out in a similar manner to the preceding determination, using hot water.

Starch and Gums.—Two grams of licorice mass are dissolved in 10 c.c. hot water, in a centrifuge tube similar to that used for "matters insoluble in cold water." The solution is cooled and 20 c.c. 80 per cent. alcohol (by volume) are added with stirring. Fifty c.c. 95 per cent. alcohol are then added gradually with stirring. After allowing to stand 2 hours, which time is found sufficient to precipitate all starch and gummy matters, the contents of the tube are centrifuged. After pouring off the clear liquor, the precipitate is stirred up with 80 per cent. alcohol and centrifuged. This operation is carried out three times in all. The precipitate, consisting of starch and gums, and of the mechanical impurity in the paste, is washed into a tared dish, evaporated and weighed. The mechanical impurities (matters insoluble in hot water) are deducted, to give the true weight of starch and gums.

Glycyrrhizin.—The clear 80 per cent. alcoholic liquor, poured off from the starch and gums, is evaporated just to dryness *in vacuo* on a water bath. The residue is transferred to a small conical beaker with 30 c.c. water and after cooling to 15° C., the crude glycyrrhizin is precipitated with 3 c.c.[2] dilute sulphuric acid (10 c.c. conc. sulphuric acid to 300 c.c. water). After standing for 2 hours (12–24 hrs. as usually recommended is unnecessary and gives lower results) at a temperature of about 10° C., the contents of the beaker are cooled in ice for half an hour, and the clear supernatant liquor poured through a small filter. The glycyrrhizin is washed four times by decantation with ice water, in which it is practically insoluble. The glycyrrhizin in the beaker, together with any that may have been transferred to the paper, is dissolved in dilute alcohol. Two drops of 5 per cent. ammonia are added to neutralize traces of sulphuric acid, and the solution is transferred to a tared dish, evaporated, and the crude glycyrrhizin weighed.

Sugars.—The filtrate and washings from the glycyrrhizin, amounting to about 70 c.c., are received in a 100 c.c. graduated flask. Enough of a concentrated solution of basic lead acetate is added to precipitate both the sulphuric acid and the resins, bitter substances, coloring matters, etc. (3 c.c. are usually sufficient). The liquid is made up to 100 c.c. and filtered into a 100 c.c. graduated cylinder. The excess of lead is exactly removed with sodium carbonate, the liquid made to 100 c.c. again, filtered, and titrated with Fehling's solution before and after inversion.

The results obtained by this method agree well with those obtained by treating the solution of the original licorice mass with basic lead acetate, and it has a number of advantages over the latter procedure, amongst which is the greater convenience of manipulation due to the previous removal of starch, gums, glycyrrhizin and other substances liable to vitiate the results.

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[2] Eriksson (*Arch. d. Pharm.*, 249, 1911, p. 147), in reproducing the method given in Parry's paper, gives the quantity of sulphuric acid erroneously as 30 c.c.

The results for sugars obtained by Parry, especially for those before inversion, are decidedly too high, and result, in my opinion, either from using too little lead acetate or more probably from failing to remove the precipitate of lead gums, lead glycyrrhizinate, etc., before eliminating excess of lead acetate with aluminum sulphate.

If this lead precipitate, which contains practically all of the licorice except starch and sugars, is not filtered off, it is partly decomposed by aluminum sulphate, regenerating substances capable of reducing Fehling's solution and falsely reckoned as sugars. This is shown by the following example:

TABLE 1.

	Without separate filtration of lead ppt.	With separate filtration of lead ppt.
	per cent.	*per cent.*
Reducing sugars	6.6	6.3
Total sugars	11.6	9.4

The necessity of using a large amount of lead acetate, if the sugar estimation be carried out on a solution of the original paste, is shown by the following results:

TABLE 2.

	Without separate filtration of lead ppt.	With separate filtration of lead ppt.			
Vol. lead acetate—cc	....	5	10	15	20
Vol. alum. sulp. to ppt. lead in filtrate—cc	....	1	2	3	4
Reducing sugars	6.6	6.3	5.1	4.7	4.0
Total sugars	11.6	9.4	8.3	7.1	6.7

The addition of more than 20 c.c. basic lead acetate does not lower the results further. The use of such a large amount of lead acetate causes the mass to set almost solid and is so inconvenient to manipulate that I have evolved the method given above for the estimation of the sugars—*i.e.*, in the filtrate from the glycyrrhizin.

Comment may be made on some of the other items in the analytical process for licorice mass.

Matters insoluble in cold water.—This is generally supposed to contain little else but starch and mechanical impurity. In the case of extracts which have been stored some time, a considerable amount of resin or allied substance may be deposited, as well as starch. The progressive deposition of starch is shown in the results below.

TABLE 3.

Age of sample.	Insolubles cold water.	Age of sample.	Insolubles cold water.
days	*per cent.*	*days*	*per cent.*
1	1.91	19	9.50
3	2.33	26	11.98
5	4.14	34	13.90
8	5.87	40	15.24
12	6.92	92	15.88
14	7.42	224	16.00

When the extract contained 15 per cent. of matters insoluble in cold water, the matters insoluble in 2 per cent. ammonia (*i.e.*, 2 parts conc. aqueous solution of ammonia to 98 parts water) amounted to only 10 per cent.—indicating a deposition of resins or similar substances of 5 per cent. This disproves the assertion by Parry[3] that, in a pure licorice extract, the matters insoluble in dilute ammonia should not exceed 6 per cent. I have examined very many samples of pure licorice which have contained more than that amount.

The increase of "matters insoluble in cold water" with age is highly variable. A sample from liquor which had been partly enzymed, increased only 1.6 per cent. in 17 days, a further 3 per cent. in the next 17 days, and had then almost reached a maximum. In other cases the deposition of starch is rapid and attains a maximum after about three weeks.

Starch and Gums.—A number of variations of the method given above have been tried.

Variation of the strength of alcohol employed gave the following results:

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[3] *Chemist & Druggist*, April 29, 1911.

TABLE 4.

Strength of alcohol by volume.	29	39	52	68	72	76	80	83	91
Per cent. starch and gums	1.7	9.8	13.6	20.2	22.4	24.4	26.2	30.6	39.7

The starch and gums precipitated by 91 per cent. alcohol contained glycyrrhizin, as evidenced by a decided sweet taste.

I have not been able, hitherto, to effect a satisfactory quantitative separation of the starch from the gummy matters, although such a separation is desirable.

Glycyrrhizin.—The following table shows that the glycyrrhizin from two grams licorice mass is completely precipitated by 1.5 c.c. of 3 per cent. (by volume) sulphuric acid.

TABLE 5.

Volume sulphuric acid—cc.	0.3	0.8	1.0	1.5	3.0	3.0	3.0
	per cent.	*per cent.*	*per cent.*	*per cent.*	*per cent.*	*per cent.*	*per cent.*
Strength sulphuric acid (by volume)	3	3	3	3	3	10	30
Glycyrrhizin	5.6	15.3	17.4	19.0	19.1	19.5	18.6

On adding further 1.2 c.c. 3 per cent. sulphuric acid to the first test, a further 13.3 per cent. glycyrrhizin was precipitated, making 18.9 per cent. in all.

On adding further 0.7 c.c. 3 per cent. sulphuric acid to the second test, a further 4.0 per cent. glycyrrhizin was precipitated, making 19.3 per cent. in all.

Other authors have used a needless and, in the light of Tschirch's work on the hydrolysis of glycyrrhizin, probably a dangerous excess of acid, to precipitate the glycyrrhizin, *e.g.*, Telle[4] uses 1 c.c. concentrated hydrochloric acid to 50 c.c. solution, and Gouirand,[5] 1 c.c. 50 per cent. sulphuric acid to 5 c.c. of the solution.

Washing with ice water is to be preferred to washing with dilute acid.

A rough idea of the degree of purity of the crude glycyrrhizin precipitated by sulphuric acid may be obtained by re-precipitating several times, and observing the successive loss in weight and increase in sweetness.

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[4] *Ann. Falsific.*, 1911, vol. iv, pp. 3–12.

[5] *Bull. de Pharm. du Sud-Est*, 1912, 86.

The loss in weight is greatest at the second precipitation, usually about 3 per cent. on original extract, while at the third and fourth precipitations, the percentage usually decreases by about 1 per cent. only. The sweetness is noticeably increased at the second precipitation, and altered but little by a third and fourth.

The following condensed analyses are cited as typical. The roots were treated in open, copper digestors provided with a steam inlet at the bottom, through which just enough steam was admitted to keep the liquor boiling. Five liquors were drawn off at intervals of 30 minutes, and the spent root finally pressed to remove adherent liquor. The liquors were evaporated in a steam-jacketed copper pan. The results are calculated to 10 per cent. root moisture and 25 per cent. moisture in the extract.

TABLE 6. ANALYSES OF LICORICE EXTRACTS.

Kind of root.	Yield of extract. Per cent.	Per cent. glycyrrhizin.	Per cent. starch and gums.	Per cent. total sugars.	Per cent. ash + extractive and coloring matter.
Russian	27.6	24.14	23.24	9.56	18.06
Syrian	26.2	19.43	18.20	19.81	17.56
Anatolian	40.6	21.96	16.37	16.89	17.56
Turk-Arabian	27.3	20.15	17.84	14.71	22.30
Italian	41.1	15.76	23.74	17.18	18.32
Spanish-Cordoba	37.7	14.32	24.08	9.37	27.23

A stronger extraction under 35 pounds' steam pressure, corresponding to 138° C., tends to lower glycyrrhizin and sugars, and to increase starch and gums. The results below are not from the same samples of roots as those in Table 6.

TABLE 7. ANALYSES OF LICORICE EXTRACTS MADE AT 35 LBS. STEAM PRESSURE.

Kind of root.	Yield of extract. Per cent.	Per cent. glycyrrhizin.	Per cent. starch and gums.	Per cent. total sugars.	Per cent. ash + extractive and coloring matter.
Russian	46.6	15.60	30.57	11.77	17.06
Syrian	41.0	14.43	30.47	11.26	18.84
Anatolian	54.0	15.41	28.63	9.36	21.60
Italian	52.0	12.47	29.84	14.70	17.99
Spanish-Cordoba	54.2	12.18	33.01	8.61	21.20

An essentially new procedure for the estimation of the most important constituents of licorice root, is that proposed by Tschirch[6] and worked out by Eriksson.[7]

The method depends on the successive reduction of Fehling's solution by glucoses, saccharose and glycyrrhizin. It is stated that these reactions occur quantitatively in the following stages:

1. Standing for about 12 hours in the cold (glucose).
2. Boiling for 3 minutes (saccharose).
3. Boiling for 15 hours (glycyrrhizin).

Certain objections to Eriksson's procedure may be mentioned.

1. Eriksson moistens the root with water and allows it to stand for several hours, whereby enzyme action unavoidably occurs, the result of which can scarcely fail to effect one or more of the stages of the reduction of Fehling's solution.

2. It is assumed that sugars and glycyrrhizin are the only substances extracted which are capable of reducing Fehling's solution, whereas licorice root contains an abundance of resinous and bitter substances which reduce Fehling's solution, and which would be partly extracted even by the comparatively mild percolation with alkaline water which Eriksson describes. If the method is to be used for sugars, a modification is necessary, involving the previous removal of such resinous and bitter substances, by basic lead acetate or by other means.

The estimation of glycyrrhizin is also open to a similar objection, in that other substances capable of reducing Fehling's solution are associated with the glycyrrhizin.

3. The method describes the estimation of sugars by successively allowing to stand with Fehling's solution for 12 hours and filtering, followed by boiling for 3 minutes. This takes no account of such saccharine matters as cane sugar, which requires inversion with mineral acid or a suitable ferment, before being capable of reducing an alkaline copper solution.

4. When the method is applied to licorice *extract* instead of the root, another source of error becomes apparent. Eriksson calls attention to a very important fact—*viz.*, the discrepancy between the glycyrrhizin content of the root and that of the extract, indicating partial hydrolysis of glycyrrhizin in the process of extraction. Tschirch[8] also states his belief that a portion of the glycyrrhizin is

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[6] Handbuch d. Pharmakog II, p. 90.

[7] *Arch. d. Pharm.*, 249 (1911), pp. 144–160.

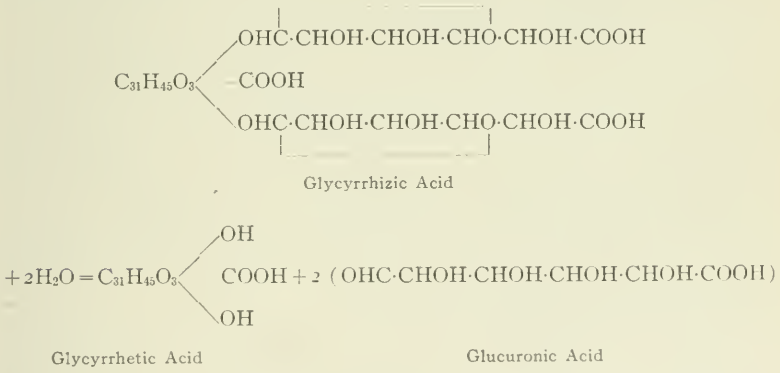
[8] Handbuch der. Pharmakog. II, p. 101.

split up, and my own experiments (communicated below) confirm this idea. The products of such partial decomposition probably include glucuronic acid, or other substances capable of reducing Fehling's solution. According to Eriksson's method, these substances would be reckoned as sugars, which error is much less likely to occur in the method I use, in which starch, gums and glycyrrhizin have been first removed, and basic lead acetate then used to precipitate other non-sugars, including glucuronic acid.

In attempting to control Eriksson's method experimentally I have been unable to obtain satisfactory results.

Experiments made on glucose and on saccharose showed that not more than three-fourths of the former was decomposed by standing with Fehling's solution for the prescribed time or longer, and that the saccharose was unaffected by 2, 3 or 5 minutes' boiling with Fehling's solution.

In a series of valuable researches, Tschirch[9] and his pupils have prepared pure glycyrrhizic acid as colorless crystals free from nitrogen. On hydrolysis it was shown to be a di-glucuronic ether of glycyrrhetic acid.


$C_{31}H_{45}O_3$
OHC·CHOH·CHOH·CHO·CHOH·COOH
COOH
OHC·CHOH·CHOH·CHO·CHOH·COOH
$+2H_2O = C_{31}H_{45}O_3$
OH
COOH + 2 (OHC·CHOH·CHOH·CHOH·CHOH·COOH)
OH

Glycyrrhizic Acid

Glycyrrhetic Acid

Glucuronic Acid

Eriksson has applied this reaction to the estimation of glycyrrhizin, by boiling for 15 hours with Fehling's solution, but I have been unable to confirm the results given, and obtained just as much cuprous oxide from a blank experiment as from the solution which contained glycyrrhizin. It is evident that the procedure given by Eriksson for the quantitative estimation of the sweet substances of licorice root and extract is not accurate.

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[9] Tschirch & Cederberg *Arch d. Pharm.*, 1907, 245, p. 97.
Tschirch & Gauchmann *Arch d. Pharm.*, 1908, 246, p. 545.
Tschirch & Gauchmann *Arch d. Pharm.*, 1909, 247, p. 121.

TREATMENT OF LICORICE ROOT WITH SOLVENTS.

The method of analysis for licorice extract which I have given at the commencement of this paper has usually been found satisfactory from a commercial standpoint. Occasionally it fails to distinguish between what are considered good and poor qualities of licorice mass. An unpalatable extract may sometimes show high values for glycyrrhizin and sugars. This discrepancy is due to the absence of quantitative estimations for such of the undesirable constituents of the extract as bitter and resinous substances. To pave the way for the elaboration of such estimations, I have commenced investigations on the root, with the idea of later transferring to the analysis of the extract, the knowledge so gained. Some of the results obtained may be communicated here.

Extraction of Licorice Root with Petroleum Ether.—Licorice root yields less than 1 per cent. of its weight to petroleum ether, and only a few roots were treated with this solvent.

Anatolian root[10] yielded 0.32 per cent. of a brown semi-solid extract, of bitter taste and unpleasant odor. On slow evaporation colorless needle-shaped crystals separated from the syrup. These are practically insoluble in petroleum ether, ether, and alcohol, but may be crystallized from warm benzene or chloroform. Further examination of these crystals is contemplated. Sodium carbonate dissolves practically nothing from the syrup, but sodium hydrate effects a partial separation.

Italian root (green) yielded 0.95 per cent. of petroleum ether extract.

Syrian root yielded 0.54 per cent., of a darker brown color than the petroleum ether extracts from the other roots.

Extraction of Licorice Root with Chloroform.—When a chloroform extract of licorice root is evaporated, a mixture of colorless crystals with a yellow fatty substance is obtained. The latter is readily removed by ether. On crystallizing the residue from chloroform, brilliant fine white needles were obtained. They are readily soluble in chloroform and benzene, insoluble in petroleum ether, ether, alcohol, and water. The yield was about 0.05 per cent. Detailed investigation of a larger quantity is contemplated.

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[10] Nickum (AMER. JOUR. PHARM., 1895, Vol. 67, p. 306), extracting Anatolian licorice root, obtained 0.54 per cent. extract, and also observed the separation of crystals from the syrup.

Extraction of Licorice Root with Alcohol.—Treatment of Extracts with Ether.—Ten kinds of root, after being picked over carefully to remove bad root and "stalk and stem," were shredded. The moisture content was about 10 per cent. The roots were dried *in vacuo* at ordinary temperature over sulphuric acid for several days until the moisture content dropped to 3.5–4.3 per cent. One hundred grams of each kind of root were then macerated with cold 95 per cent. alcohol. Three liquors were taken off, the first two being worked up together and the third separately, in order to be assured that the extraction was carried far enough.

The alcoholic liquors were evaporated *in vacuo* from a water bath. After weighing the dried extracts, they were treated as long as any resins dissolved, with ether which had been washed with water, dried over calcium chloride and redistilled.

The following tables show the distribution which occurred:

TABLE 8. DISTRIBUTION OF RESINS, BITTER PRINCIPLES, &C., IN LICORICE ROOTS.[11]

Kind of root.	Soluble in alcohol and ether (resins, &c.).	Soluble in alcohol, insoluble in ether. (Bitter principles, some sugars, &c.)	Total resins and bitter principles, &c.
	per cent.	*per cent.*	*per cent.*
Russian	4.12	8.16	12.28
Syrian	3.03	9.16	12.19
Anatolian	2.35	10.04	12.39
Turkish-Arabian	1.75	10.56	12.31
Italian	2.82	9.76	12.58
Spanish-Alicante	3.27	9.18	12.45
Spanish-Cordoba	2.96	8.97	11.93
Spanish-Zaragossa	2.07	8.78	10.85
Spanish-Seville	2.00	10.75	12.75
Spanish-Toledo	2.26	10.11	12.37

There is less difference between the various kinds of roots than might have been expected. In repeating the work, the above results were in the main confirmed. Considerable variations are caused by slight changes of root moisture, and also by using the root as received, without picking out the "stalk and stem." Since the roots usually contain at least 10 per cent. of "stalk and stem," derived from that part of the plant growing above the ground, it is of importance to separate this portion, in order to obtain comparative results.

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[11] All results are on the roots as used, containing 4 per cent. moisture.

The bitter principles were then treated with water, and in the soluble portion the sugars[12] were estimated. *No glycyrrhizin could be found in the 95 per cent. alcoholic extract.*

TABLE 9. TREATMENT OF BITTER PRINCIPLES &C, WITH WATER.

Kind of root.	Total bitter principles, &c.	Insoluble in water.	Soluble in water (non-sugars).	Soluble in water (sugars).
	per cent.	*per cent.*	*per cent.*	*per cent.*
Russian	8.16	2.29	3.05	2.82
Syrian	9.16	3.08	3.07	3.01
Anatolian	10.04	3.52	3.62	2.90
Turkish-Arabian	10.56	4.18	3.92	2.46
Italian	9.76	3.78	3.38	2.60
Spanish-Alicante	9.18	2.58	3.31	3.29
Spanish-Cordoba	8.97	3.20	3.18	2.59
Spanish-Zaragossa	8.78	2.93	3.05	2.80
Spanish-Seville	10.75	3.47	3.31	3.97
Spanish-Toledo	10.11	2.93	3.38	3.80

Extraction of Licorice Root with 50 Per Cent. Alcohol.—After the resins and bitter principles, together with some non-reducing sugars, had been extracted from the roots, they were macerated with 50 per cent. alcohol (by volume), which solvent was found to remove the glycyrrhizin quantitatively and very conveniently.

Four liquors were taken off, the fourth being worked up separately. In the fourth liquor the glycyrrhizin varied from 0.11 per cent. for Toledo to 0.57 per cent. for Anatolian, so that the extraction may be regarded as complete.

The 50 per cent. alcoholic extracts were evaporated *in vacuo* and weighed. They were almost completely soluble in water. Their amounts and composition are appended.

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[12] The sugars consisted almost entirely of "non-reducing sugars."

TABLE 10. DISTRIBUTION OF GLYCYRRHIZIN, &C., IN LICORICE ROOTS.

Kind of root.	Total 50 per cent. alcohol extract.	Glycyrrhizin.[13]	Sugars.[14]	Substances not glycyrrhizin, but mostly precipitated by lead acetate.
	per cent.	*per cent.*	*per cent.*	*per cent.*
Russian	23.35	9.88	3.95	9.52
Syrian	20.00	7.44	3.40	9.16
Anatolian	30.95	13.24	4.53	13.18
Turkish-Arabian	23.45	8.87	4.46	10.12
Italian	23.98	9.18	2.72	12.08
Spanish-Alicante	27.24	10.06	5.13	12.05
Spanish-Cordoba	21.21	8.37	3.10	9.74
Spanish-Zaragossa	25.38	7.41	1.88	16.09
Spanish-Seville	21.96	7.16	4.50	10.30
Spanish-Toledo	20.48	5.89	1.56	13.03

The results described above may be conveniently brought together in one table.

TABLE 11. SUBSTANCES SOLUBLE IN ETHER, 95 PER CENT. ALCOHOL AND 50 PER CENT. ALCOHOL.

Kind of root.	Resins.	Bitter principles, &c., sol. in water.	Bitter principles, &c., insol. in water.	Glycyrrhizin.	Sugars.	Other substances sol. in 50 per cent. alcohol.	Total extraction with 95 per cent. and 50 per cent. alcohol.
	per cent.	*per cent.*	*per cent.*	*per cent.*	*per cent.*	*per cent.*	*per cent.*
Russian	4.12	3.05	2.29	9.88	6.75	9.52	35.61
Syrian	3.03	3.07	3.08	7.44	6.41	9.16	32.19
Anatolian	2.35	3.62	3.52	13.24	7.43	13.18	43.34
Turk-Arabian[1]	1.75	3.92	4.18	8.87	6.92	10.12	35.76
Italian	2.82	3.38	3.78	9.18	5.32	12.08	36.56
Spanish-Alicante	3.27	3.31	2.58	10.06	8.42	12.05	39.69
Spanish-Cordoba	2.96	3.18	3.20	8.37	5.69	9.74	33.14
Spanish-Zaragossa	2.07	3.05	2.93	7.41	4.66	16.09	36.21
Spanish-Seville	2.00	3.31	3.47	7.16	8.47	10.30	34.71
Spanish-Toledo	2.26	3.38	2.93	5.89	5.36	13.03	32.85

[1] The Turkish-Arabian root was not of a very good quality.

The Anatolian contains the highest percentage of glycyrrhizin, but also larger amounts of the other constituents. The bitter principles soluble in water are very uniform in the whole ten roots. Russian root contains the most resins.

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[13] This glycyrrhizin was of a light brown color, and of a purer and stronger sweet flavor than that usually obtained from licorice mass by direct precipitation with sulphuric acid. It is free from associated resinous and bitter substances, and therefore the most convenient starting-out material for Tschirch's preparation of pure glycyrrhizin.

[14] The sugars were all "reducing sugars." (cf. 95 per cent. alcoholic extract, which contained "non-reducing" but no "reducing sugars.")

The resins are confined entirely to the bark,[15] as the following results show:

TABLE 12. DISTRIBUTION OF RESINS IN BARK AND DECORTICATED ROOT.

Kind of root.	Soluble in alcohol and ether (resins).
	per cent.
Anatolian (decorticated)	0.1
Anatolian (bark)	10.5
Syrian (decorticated)	0.7
Syrian (bark)	14.1

In actual factory practice, most of the resins remain in the spent root. In one series of experiments, various roots were given a strong extraction under 35 pounds' steam pressure, and the exhausted root, when dried and extracted with ether, showed that from 68–88 per cent. of the total resins remained in the spent root, and from 12 per cent. to 32 per cent. passed into the extract. The reverse is the case with the bitter principles, almost all of which pass into the extract.

In another series of experiments, the root was boiled with water in an *open* extractor. Five liquors were drawn off, each acting on the root for half an hour. Only a trace of glycyrrhizin was found in the spent roots, which, however, retained most of the resins—in one case as much as 98 per cent. of the total resins of the original root. In this series also, only about 10 per cent. of the bitter principles remained in the spent roots.

An examination for tannins, of licorice root and of the extract, by Procter's hide-powder method, showed a small quantity to be present, but far too little to play any important part in the chemistry of the root or extract.

An important subject, especially from a commercial standpoint, is that dealing with the changes in the constituents of licorice root during curing and extraction, and during evaporation of the extracted juice. The most important substance concerned is glycyrrhizin, and my own experiments, which I shall briefly communicate, confirm the opinion of Tschirch [16] and Eriksson [17] that a portion of the glycyrrhizin is decomposed in extraction.

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[15] The percentage of resins found in the roots will consequently vary with the *size* of the sticks taken. The smaller the sticks, the larger will be the proportion of resins they contain.

Ten roots similar to those used for the estimation of resins, bitter principles, glycyrrhizin, etc., were extracted in open copper extractors with boiling water, just enough steam being admitted to keep the water boiling. Five waters of half an hour each were taken off, and the liquors evaporated to a syrup *in vacuo*, and finished to about 25 per cent. moisture in a small, copper, steam-jacketed "finisher."

The following table contains the comparison of the glycyrrhizin contents of the roots and of the licorice pastes made from them. All results are calculated on roots containing 4 per cent. moisture.

TABLE 13.

Kind of root	Per cent glycyrrhizin in original root.	Glycyrrhizin in paste, calculated as per cent. of root.	Loss, as per cent. of root.	Per cent. decomposed of total glycyrrhizin.
Russian	9.88	7.10	2.78	28.1
Syrian	7.44	5.43	2.01	27.0
Anatolian	13.24	9.52	3.72	28.1
Turkish-Arabian	8.87	5.91	2.96	33.3
Italian	9.18	6.91	2.27	24.7
Spanish-Alicante[1]	10.06	4.90	5.16	51.3
Spanish-Cordoba	8.37	5.76	2.61	31.2
Spanish-Zaragossa	7.41	5.01	2.40	32.4
Spanish-Seville	7.16	4.88	2.28	31.8
Spanish-Toledo	5.89	4.28	1.61	27.3

[1] The result on Alicante should be rejected. A delay caused fermentation to commence in the liquor.

Estimations of glycyrrhizin in the liquors before evaporation showed that the loss of glycyrrhizin occurred partly during extraction and partly during evaporation. The proportions were rather uneven in the different roots, but in most cases the greater part of the loss fell on the extraction stage. The spent roots were practically free from glycyrrhizin.

It is not intended to regard the figures given in this paper as fixed standards for the ten roots examined. Considerable differences are found amongst the same kinds of root, due to many factors (such as age, curing, climatic conditions, size of root, admixture of "stalk and stem," etc.), some of which were not under control.

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[16] Handbuch d. Pharmakog. II, p. 101.

[17] *Arch. d. Pharm.*, 1911, 249, p. 160.

SUMMARY.

1. A method of analysis for licorice mass is given, with comments thereon, and remarks on other methods proposed.
2. The constituents of licorice root, which were obtained by various solvents, have been quantitatively compared in ten different roots, and results given for resins, bitter principles, glycyrrhizin and sugars. The resins were shown to be confined to the bark of the root, and with mild extraction with hot water, they remain mostly in the exhausted root.
3. It was found that nearly one-third of the most important constituent of the root—the glycyrrhizin—is not accounted for when the root is extracted with hot water, and is presumably decomposed.

It is reserved for a future communication to describe the physical and chemical properties of the substances obtained in this investigation. It is also intended to transfer the knowledge gained of the constituents of the root, to improving the method of analysis of the extract, so as to include some of the undesirable constituents thereof.

For able assistance in the experimental work I am indebted to Messrs. Bertrand Schneeberg and Joel Harris. My thanks are especially due to the MacAndrews & Forbes Company of Camden, New Jersey, for liberal encouragement in work which has as one of its ultimate aims, the establishment, if it be possible, of chemical standards of quality and purity for licorice root and extract.

Laboratory of the MacAndrews & Forbes Company,
Camden, New Jersey.
October, 1912.

CULTIVATION OF MEDICINAL PLANTS.

By John A. Borneman, P.D., Lecturer in Pharmacy Hahnemann Medical College, Phila., Pa.

The cultivation of medicinal plants has been advocated from time to time for the past fifteen years, but it is only in recent years that the subject has been given the attention it deserves. Many of our most valuable medicinal plants, once abundant from natural sources, are becoming exhausted, due no doubt to the larger demand for the drug, but more so because our forests are being destroyed and waste land devoted to agriculture. Since it has been proven that the cultivated plant yields as large and more often a larger amount of alkaloids or glucosides than the same species of the wild plant, there should be no reason why the cultivation of medicinal plants should not make rapid strides in this country.

I will take up the different plants that I have had under cultivation at the H. K. Mulford Drug Farm at Glenolden, Pa., and endeavor to show how successful the cultivation of drugs has been, also some of the difficulties that will be met with. The illustrations and assays will show that the cultivation is practical and even profitable, and most certainly becoming necessary in this country.

DIGITALIS PURPUREA L.

Digitalis purpurea is one of the easiest plants to cultivate, thoroughly acclimated in this country, and free from destruction by insects; it is the ideal plant for the amateur drug grower to begin with. The plants were grown from seeds purchased from Henry A. Dreer of Philadelphia, and the strain selected was digitalis gloxineæflora mixed; this species is the one that furnishes most of the fox glove found in our gardens and is very hardy. The plant can be raised from seed in a cold frame, hotbed or hothouse. If the seed is to be grown in a cold frame it should be sown in the fall; the soil should be well prepared, being a mixture of well rotted sod, manure and sand; it should be very fine and the soil sterilized. Seed should be sown in drills about one quarter of an inch deep and five inches between the rows; the soil should then be well firmed and covered with leaves. The plant can stand any ordinary amount of cold, but during very cold weather when the temperature goes down to zero it is advisable to cover the frames with matting or old carpet.

If it is desirable to start the plants in hothouses, the time to do so would be about the first week in March. The plants will come through the ground in about nine days and at the end of three weeks will be ready to transplant into pots or out in the plats. The soil in the plats should be of the same nature as that in the forcing houses and the plants should be set out when about two inches high and have two or more leaves. The seedlings should be set in rows about five inches in the rows and about six inches between the rows. The plants should be left in the plats until they are about six inches high and have developed a good strong root, when they are ready to put out in the permanent bed; a day for

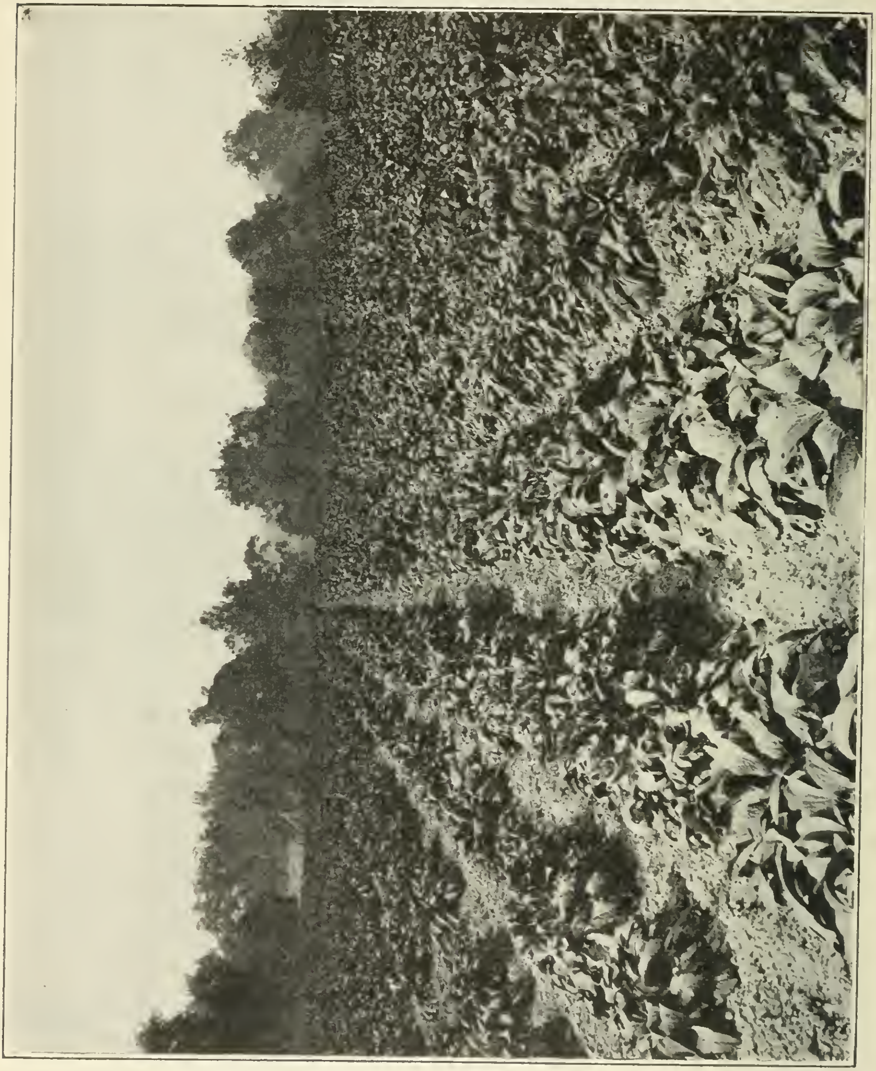


Fig. 1.

Digitalis purpurea; first year's growth, at The H. K. Mulford Co. Drug Farm, Glenolden, Pa., John A, Borneman, P. D., in charge.

transplanting should be selected when there is not too much sun, and if possible, after a light rain; in that way the plant will have no set back and keep right on growing.

The soil for the seedling should be well prepared, having been limed and well mulched, and plowed the previous fall and again plowed and well harrowed just before setting out the plants. The soil should be fine, and if the weather is very dry the plants should be puddled or at least the roots kept in water until the plant is ready to put in the ground. The plants should be set out twenty-four inches in the rows and three feet between the rows. The plants must have good attention; the soil should be kept loose around the plants and the whole fields given a thorough cultivation at least once a week for the first month.

The plants seem to do better during a moist season, but make a good growth even during very dry weather. Each plant will average about two pounds by the first week in September and quite a few of them will flower the first year. It is very interesting to note that the first year's plant of digitalis shows a higher percentage of glucosides than that required by the pharmacopœia, and therefore should be admitted to the U. S. P. It would then pay to cultivate the drug as the yield of the first year is about three times that of the second year.

HARVESTING OF DIGITALIS.

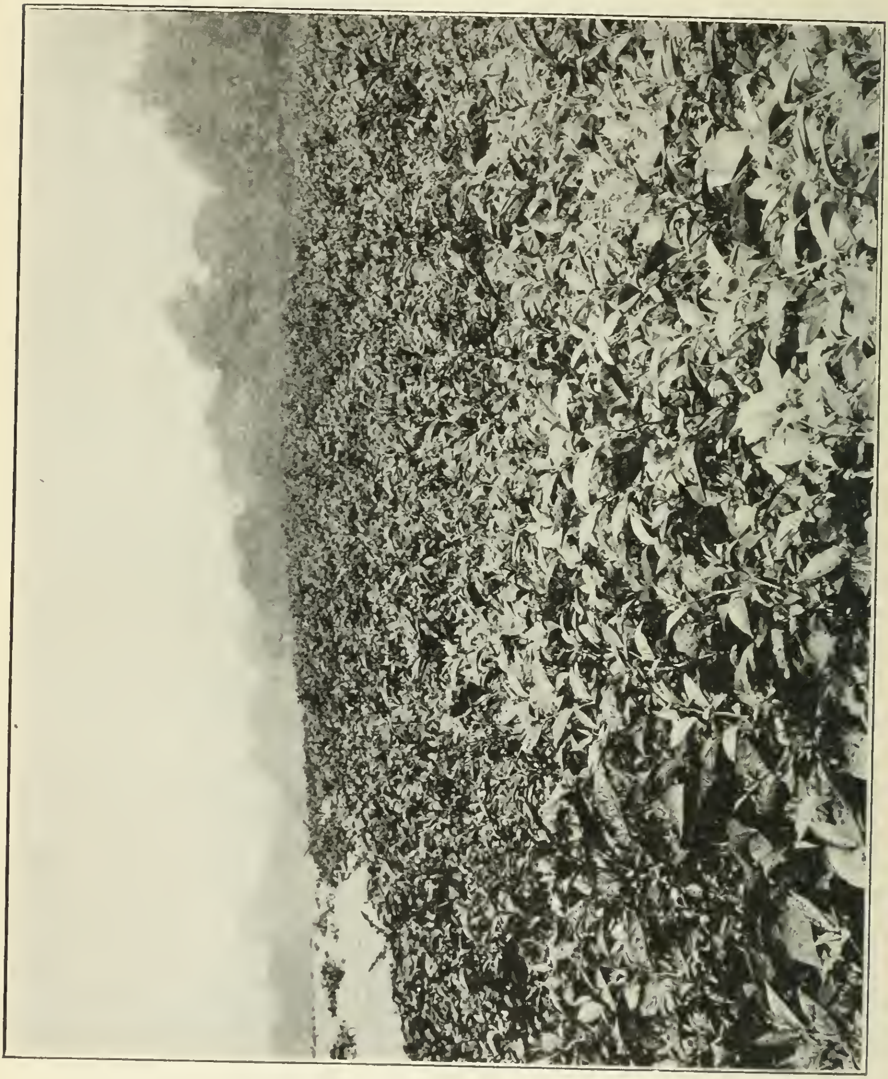
The plant can be collected any time after flowering or even as late as September or October. The plants should be dried quickly by artificial heat; the ovens should be well ventilated and the heat gradually raised to 100° C. Drying will be complete in about twenty-four hours; the dry plants should be kept in air-tight containers with some freshly slaked lime.

ASSAY OF FIRST YEAR'S DIGITALIS LEAVES.

Digitoxin 0.304 per cent. Physiological report: Minimal lethal dose 0.6 c.c., corresponding to 166.669 of normal.

ATROPA BELLADONNA L.

The seed of belladonna can be sown in exactly the same way as the digitalis, but care must be taken not to bury the seed too deep, about a quarter of an inch is plenty; firm the soil lightly and cover with leaves. The plants should be transplanted into plats and set out in the field when about five inches high. The ground must be prepared in exactly the same way as for digitalis, and a



Atropa Belladonna; first year's plant, grown at The H. K. Mulford Co. Drug Farm, Glenolden, Pa., John A. Borneman, P.D., in charge.

day after a heavy rain should be selected to set out the plants. The roots should be cut back a little as well as the top of the plant.

The plant must have thorough cultivation at least once a week during dry weather. Care must be taken not to place the plants too close together, three feet in the rows and four feet between rows will be about right.

Care must also be taken to keep the young plants free from insects, and they should therefore be sprayed often; while the plant is still young it should be sprayed with lemon oil and whale oil soap, and as the plant becomes stronger a weak solution of lead arsenate may be used.

HARVESTING OF BELLADONNA.

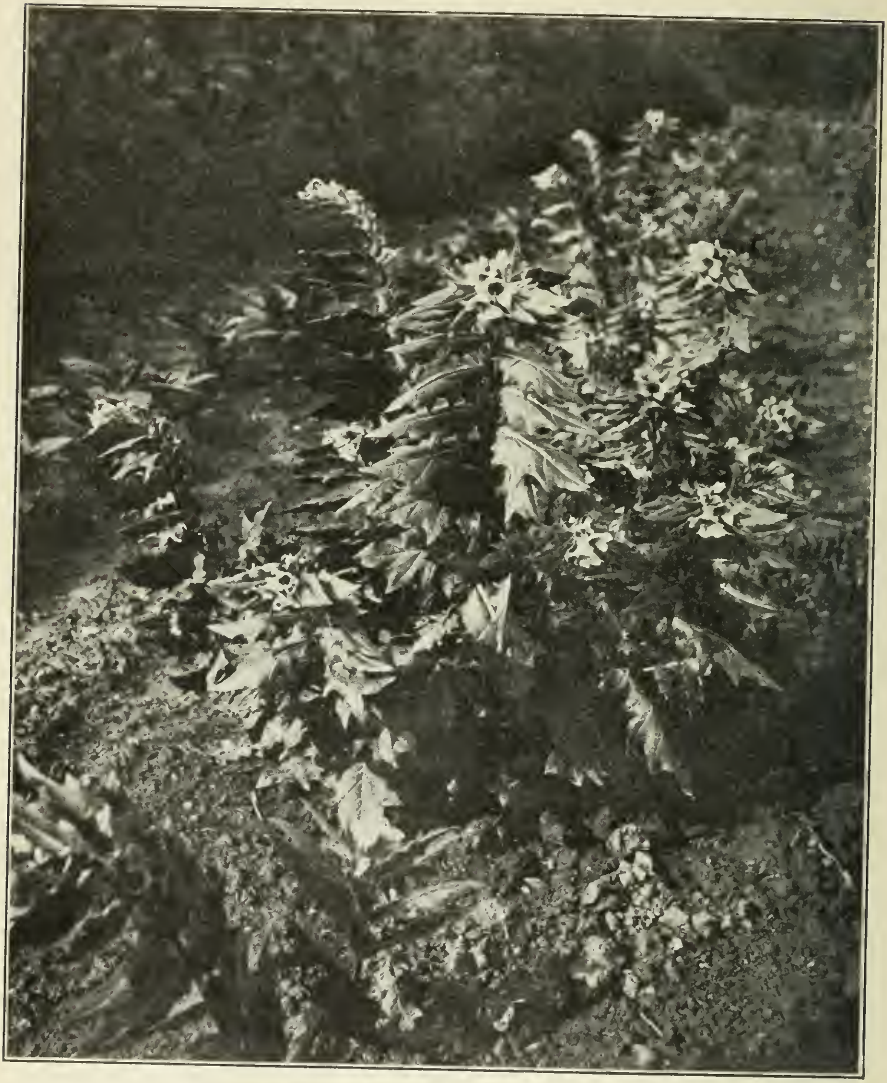
The plant can be harvested any time in fall, but care should be taken to gather the plant at the first sign of the leaves becoming yellow. There is a rapid deterioration of the alkaloid as soon as the plant begins to turn, therefore it is advisable to look after the plant the latter part of August. The drying should be rapid an artificial means employed. The root of the first year should be buried during the winter and then divided and planted the next spring. The roots can be set out as early as the middle of March, and this will insure getting two cuttings from the belladonna the second year. The yield of fresh belladonna the first year is about twelve tons per acre.

Assay from plants of the first year.—Mydriatic alkaloid from roots, 0.53 per cent.; from leaves, 0.58 per cent.

HYOSCYAMUS NIGER L.

Hyoscyamus niger I have found to be the most difficult of all the Solonacea family to cultivate, owing to its destruction by insects. The seed is started the same as digitalis but only in hotbeds or forcing houses. The seedlings must be protected from insects while still in the forcing house, and must be fumigated often with tobacco or hydrocyanic acid fumes. After the plant is set out in the plats it must be sprayed every day with kerosene emulsion. After the plants have been set out in the permanent beds it will be necessary to spray the plants with Paris green almost every day or the potato bugs will devour the plants in one day. The plants stand the winter very well, but are very often destroyed the second year by wire worms getting to the roots and the potato bugs seem to like the plant the second year even more than they do the first year. If care is taken with the plants one is repaid with very beautiful specimens, but very much disappointed with the resulting assay, which very rarely comes above 0.06 per cent. I do not think that it will pay to raise this plant unless

FIG 3.



Hyoscyamus niger; first year's growth, at The H. K. Mulford Co. Drug Farm, Glenolden, Pa., John A. Borneman, P. D., in charge.

it is possible to bring the assay up to standard and getting a good price for the drug.

Assay of the second year leaves.—Mydriatic alkaloids 0.06 per cent.

CANNABIS SATIVA L.

Cannabis sativa and *Cannabis indica* can be very readily cultivated. The seed can be sown in the cold frames or hotbeds, and when about four inches high can be set out at once in the field. The ground should be well mulched and not contain too much clay. The plants should be set out about three feet in the rows and four feet between the rows. The plants make a very rapid growth and often reach a height of about twelve feet in three months. The male plants should be removed, and the plant harvested about the time the seed develops.

HYDRASTIS CANADENSIS L.

Propagation is best carried on by means of dividing the roots; the plant can be transplanted during spring or late in fall. I made my planting from the fresh roots during the month of May; planting the rhizomes in the shady woodland, which had previously been put in shape by removing all shrubbery and wild vegetation. The soil was very rich in decayed leaf mould. The rhizomes were cut in several pieces and then set in the ground in rows six inches each way, and the whole field covered with leaf mould. All the plants made a rapid growth and can be taken up during the fall of the second year and again be divided, so that in a few years I should have several acres of hydrastis plants. I think the best method of raising hydrastis would be by producing artificial shade; while that would be the most expensive way to begin, I think it would pay in the yield of hydrastis. I think that the plant which is raised in the woodland makes a very much slower growth and does not nearly assay so well as that raised under artificial shade.

Hydrastis cultivation is very simple and all the plant requires is that it be kept free from weeds and grass; it does not require any cultivation to speak of, and can stand the winter very well. I think it would pay anyone to cultivate the drug as the price is advancing all the time.

PROGRESS IN PHARMACY.

A Quarterly Review of Some of the More Interesting Literature Relating to Pharmacy and Materia Medica.

By M. I. Wilbert, Washington, D. C.

Prospective legislation is still attracting the attention of pharmacists in practically all sections of the country, and at the annual conventions of associations related to the various sections of the drug business considerable time was devoted to the discussion of legislative matters.

In many of the states the legislatures will be in session during the coming winter and efforts will undoubtedly be made to bring about greater uniformity in the requirements embodied in the food and drug laws and probably in other legislation relating to or affecting the practice of pharmacy. This is indicated by the evidently growing appreciation of the frequently made statement that greater uniformity between National and State food and drug laws would be favorable to the more economical conduct of interstate business and several at least of the National organizations have placed themselves on record as being in favor of greater uniformity in State and National legislation.

Anti-narcotic legislation was also discussed quite extensively and many of the more influential members of the drug trade appear to appreciate the need for some form of regulation to regulate the interstate traffic in narcotic and habit forming drugs. That State legislation of this kind is becoming more satisfactory is evidenced by the phraseology of the laws recently enacted in Kentucky and in Maryland. Both of these laws are designed to include a greater number of narcotic substances than have been included heretofore.

Another legislative subject that is attracting more than passing attention is the use and sale of methyl or wood alcohol. Two states, Rhode Island and New Jersey, have recently enacted laws forbidding the use of this substance in food or drink and otherwise safeguarding its use.

The passage by Congress of the Sherley amendment to the Pure Food and Drug Act is generally considered to be a satisfactory solution of the evident need of the National law and the amendment should tend to protect the honest manufacturer and dealer as well as the public.

INTERNATIONAL PHARMACEUTICAL FEDERATION.—The organization meeting of the federation was held at The Hague in September and the reported discussions promise that this organization is destined to be a factor in the future progress of pharmacy. The *Pharmaceutical Journal* (1912, v. 35, p. 481) points out that the Bulletin of the International Pharmaceutical Federation, which has now been issued, is a well printed book of 290 pages, containing the rules of the Federation and particulars concerning pharmacy in a number of countries.

INTERNATIONAL CONGRESS OF PHARMACY.—The eleventh International Congress of Pharmacy is to be held at Scheveningen, a charming seaside resort, within easy walking distance of The Hague, so that the members of the Congress who prefer to do so may " put up " at the latter city without any inconvenience. His Royal Highness Prince Henry has consented to bestow his patronage on the Congress.—*Pharm. J.*, 1912, v. 35, p. 313.

The preliminary program, a pamphlet of 28 pages, indicates that the Congress has been planned on rather broad lines and is destined to attract members from all portions of the world.

PHARMACEUTICAL EDUCATION.—An editorial (*Chem. and Drug.*, 1912, v. 81, p. 300), in discussing pharmaceutical education, points out that degrees in pharmacy are granted by two British Universities—viz., Manchester and Glasgow—but so far few persons have availed themselves of the opportunity of becoming graduates of these institutions.

COLLEGE OF PHARMACY, AN EARLY.—Schelenz, Hermann, calls attention to a book by Alfred Poussier on the institution at Rouen in the beginning of the sixteenth century of a college of pharmacy and an analytical laboratory. This college was evidently the outcome of the inability or unwillingness of apothecaries to teach their apprentices and the general recognition that systematic instruction would be of advantage to them.—*Pharm. Zentralh.*, 1912, v. 53, p. 1082.

U. S. PUBLIC HEALTH SERVICE.—The Treasury Department bureau known formerly as the Marine Hospital Service and recently as the Public Health and Marine-Hospital Service has within the last month become, by virtue of a new legal provision, the United States Public Health Service. Its activities have so expanded in recent years that the care of the Marine hospitals has become but a minor part of them. The Public Health Service is one of the most prolific publishers among the Government bureaus and its publications are in active demand. Its weekly magazine, " Public Health Reports," is in its 27th annual volume, and 89 articles from it have been separately printed in pamphlets known as " separates." Its bulletins from the Hygienic Laboratory number 84 and those from the Yellow Fever Institute 17. In the series called Public Health Bulletins there are 53 separate publications. The annual reports of the Service began in 1872.—*Monthly Catalogue United States Public Documents No.* 212, August, 1912, page 77.

The Drugs We Need.—Osborne, Oliver T., in discussing the drugs that we need, points out that the physician could succeed with a remarkably few of the present official drugs. He states that a thorough knowledge of the pharmacologic activities of some drugs and of the pharmacologic uselessness of other drugs is now necessary in the preparation of the medical student. Having such knowledge, he will not make the mistakes long made in the use of drugs. Osborne believes that instruction in and examination on useless drugs only will be a cure for the mistake of using nostrums, proprietaries, or even absurd and useless pharmacopœial preparations.—*J. Am. M. Assoc.*, 1912, v. 59, pp. 1160–1163.

Drug Therapy.—Calvin, W. D., thinks that 95 per cent. of the practitioner's drug therapy is done with fewer than ten drugs, and while he does not believe less in drug therapy than he did when he left college, he has much less confidence in most of the drugs of the Pharmacopœia than he had at that time.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1164.

Medicines, Use of.—Wilbert, M. I., in a report of the work of the Committee on Useful Remedies, points out that the present misuse of medicines has been designated as consisting of a series of vicious circles: Patent medicines are used by the laity because they are advertised by manufacturers, and they are advertised by manufacturers because they are used by the laity. The closely related proprietary medicines are prescribed by physicians because they are advertised in medical journals, and they are advertised in medical journals because this leads to their being prescribed by physicians. Official remedies are official because they are endorsed by text-books, and are endorsed by text-books because they are official. *J. Am. M. Assoc.*, 1912, v. 59, p. 1163.

Council on Pharmacy and Chemistry.—An editorial (*J. Am. M. Assoc.*, 1912, v. 59, p. 291) points out that German physicians have finally come to recognize the evil connected with the proprietary medicine business and the extent to which this is a detriment to the progress of medicine and have organized a German council on pharmacy and chemistry to be known as Die Arzneimittelkommission des Kongresses für innere Medizin. The commission has collected from twenty-one of the most widely circulated German and Austrian medical journals about 1,000 advertisements of remedies, and after careful investigation has arranged them in three lists. (See Am. J. Pharm., September, 1912, p. 415).

New Remedies.—An unsigned article (*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 512) points out that the pharmaceutical laboratories of the Universities of Bonn, Giessen, Göttingen, and Munich have contributed a number of communications on the examination of medicines and articles recommended for use as medicines. These communications have been printed in the pharmaceutical and medical journals and have no doubt contributed materially toward arousing an appreciation of the need for reform in medical practices.

Proprietary Medicines.—In Great Britain the House of Commons Committee, appointed to inquire into the sale of patent and proprietary medicines and medical preparations and appliances, and advertisements relating thereto, is getting together a mass of evidence that will no doubt have a marked influence on the future development of the manufacture and sale of proprietary remedies in this country as well as in Great Britain. W. E. Dixon, in discussing some of the abuses of the proprietary trade at a recent hearing before this committee, stated that at the present time the medical profession and retail chemists are in many cases greatly fogged by the large number of proprietary names for one and the same substance. Acetyl salicylic acid, for instance, is being sold under the names: aspirin, salacetin, saletin, xaxa, etc. The aryl arsenates have several names, such as atoxyl and soamin. Dixon thinks that one name only should be allowed to each substance.—*Chem. and Drug.*, 1912, v. 81, p. 690.

Trademarks.—Wickboldt, in discussing German trademark laws and the proposition of Rathenau to restrict trademarked names to one and declare this public property as soon as it becomes widely used, suggests that the government in granting a trademark also undertake to regulate the price of trademarked articles so as to prevent inordinate profits.—*Therap. Monatsh.*, 1912, v. 26, pp. 724–726.

Patent Medicine.—An editorial (*Nat. Druggist*, 1912, v. 42, pp. 414–415) calls attention to some census figures on patent medicine production to demonstrate that the long continued warfare that has been waged against the patent medicine business has served to increase rather than diminish the volume of business done. The editorial states that the number of establishments engaged in the manufacture of patent and proprietary medicines in 1899 was 2,154, in 1904 2,777, and in 1909 3,642. The value of the products at the factories in 1899 was $88,791,000, in 1904, $117,436,000, and in 1909, $141,942,000. The figures as to value of products do not mean the total value at retail, but at the factory. Of course, some part of this great increase in value of products is occasioned by the higher cost of raw materials and of manufacture.

MEDICINAL PLANT CULTIVATION.—An editorial note (*Pharm. J.*, 1912, v. 35, p. 313) states that medicinal plant cultivation is about to be undertaken on an extensive scale in Hungary, where labor of the kind required is cheap and other conditions appear to be favorable to the project. One of the prime movers in the matter is the President of the Hungarian Pharmaceutical Society, and many manufacturing chemists and pharmacists have identified themselves with the scheme.

An unsigned article (*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 505) calls attention to a report by Mitlacher on some recent experiences in the cultivation of medicinal plants.

An editorial note (*Pharm. J.*, 1912, v. 35, p. 363) discusses the possibility of improving drug plants by the employment of standard methods of breeding, such as the selection of seed and young plants, the isolation and testing of favorable varieties, the study of soil and climatic conditions, trials in hybridization, grafting, or other methods which might prove applicable.

STERILIZATION.—Holz, Max, reviews the requirements made by the several Pharmacopœias in regard to sterilization, and concludes that in connection with the preparation and sterilization of medicines there is still much to be done for hygiene.—*Centr. Bakt. Parasitenk.*, 1912, v. 64, pp. 81–86.

ALCOHOL, ANTISEPTIC PROPERTIES OF.—An unsigned article (*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 631) points out that the fact that 70 per cent. alcohol is more active as an antiseptic than either higher or lower concentrations is thought to be due to the peculiar action of this strength of alcohol on dried albumen. It has been found that only the moderate concentration changes albumen in the sense of a coagulation so that its faculty of swelling and dissolving in water is lost. Both the weaker and stronger concentrations are less active in this respect.

GERMAN PHARMACOPŒIA.—The fifth edition of the German

Pharmacopœia is still being actively discussed in the Pharmaceutical Journals of Germany and the Continent of Europe generally. While the tenor of this discussion is generally favorable it is nevertheless critical and designed to call attention to the several errors of omission and of commission that are embodied in the Pharmacopœia.

TINCTURES.—Richter, R., in discussing the tinctures of the Ph. Germ. V states that the practice of making tinctures by maceration has been retained in this pharmacopœia much to the surprise of German pharmacists who have repeatedly pointed out that percolation gives results that are more generally satisfactory than does maceration. He also points out the desirability of comminuting the several drugs at the time they are to be used rather than buying commercial powdered drugs. This is further emphasized by the impracticability of controlling the nature of the powdered drug. —*Pharm. Zentralh.*, 1912, v. 53, pp. 1943–1946.

WEIGHTS AND MEASURES.—An editorial (*Pharm. J.*, 1912, v. 35, p. 416) expresses the belief that metric weights and measures will probably never become established as an exclusive system in this country; they may not be used, in the immediate future, if ever, to any greater extent than obtains at the present. It is only in scientific literature where we find the system firmly placed on a practical basis. Clumsy and inconvenient as our British tables of weights and measures may sometimes be, there is absolutely no substantial sign of their giving way to the attacks made on them by advocates of the metric system.

ACETYLSALICYLIC ACID.—Anderson, H. B. (*Canadian Pract. and Rev.*, September), cites two cases of angioneurotic eruption due to acetylsalicylic acid. Both patients suffered with slight digestive disturbances and constipation, but were otherwise quite healthy. The administration of acetylsalicylic acid in 5 grain doses was promptly followed by a marked generalized urticarial eruption. The itching was intense, the lips swollen and in one case the face was so swollen as to close the eyes.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1470.

ALCOHOL-GLYCERIN.—Dörken, Fritz, suggests the use of equal parts of alcohol and glycerin as a wet dressing in place of lead water and laudanum, solution of aluminum acetate and other similar preparations. He thinks that the alcohol and glycerin preparation is more cleanly and in many ways more satisfactory than any of the other commonly used wet dressings. The preparation is strongly antiphlogistic and comparatively non-irritating.—*Therap. Monatsh.*, 1912, v. 26, pp. 711–721.

ALENDRIN.—Alendrin, the carbaminic acid ester of *aa*-dichlorisopropylalcohol, occurs as white odorless crystals that melt at 82°, is slightly soluble in alcohol and readily soluble in other organic solvents and in fatty oils.—*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 605.

ALLANTOIN.—An oxidation product of uric acid; occurs as colorless crystals that melt at 226°. Allantoin is readily soluble in hot water or in alcohol.—*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 605.

ANTIKAMNIA.—An editorial (*J. Am. M. Assoc.,* 1912, v. 59, p. 1550) calls renewed attention to the claim that antikamnia sold in Great Britain has a different formula from the antikamnia sold in the United States, and reports that a package of antikamnia recently purchased in Great Britain, on examination, was found to contain acetanilid.

APIOL.—Lutz and Oudin (*Annales des Falsifications*) think that, where possible, green apiols should be rejected in preference to yellow apiols prepared by saponification or apiolines decolorized by animal charcoal.—*Chem. and Drug.,* 1912, v. 81, p. 686.

ARTIFICIAL MILK.—An editorial note (*Pharm. J.,* 1912, v. 35, p. 482) points out that milk from soya beans is a product which may be used on an extensive scale in the near future. Nearly all the daily papers are devoting paragraphs to descriptions of the production of an "artificial milk made by machinery." The new milk is described as a "synthetic product composed from cereals and water. The fat of the soya bean is a considerable ingredient, and other fats, as well as beet sugar, enter into it." It can be made as thick as desired and the ordinary "family milk" brand of this product is said to be 15 per cent. more nutritious than the best cow's milk, and it could be sold profitably at threepence per quart.

ASAFETIDA.—Koenig, Paul, discusses the varied uses for asafetida in Egypt and points out that it is one of the popular remedies for increasing the weight of females and is generally believed to be valuable as an insecticide.—*Südd. Apoth.-Ztg.,* 1912, v. 52, p. 497.

Bufagin is the name applied by Abel and Macht to a secretion of the parotid gland of the toad, *Bufo agua;* this substance has a digitalis-like action. Clinical experiments have as yet not been reported.—*Südd. Apoth.-Ztg.,* 1911, v. 52, p. 605.

CALCIUM GLYCEROPHOSPHATE, POOR QUALITY OF.—Puckner, W. A., in reporting on five samples of this article, points out that none of the specimens examined complied with the generally accepted requirements for solubility in water, and that those which were most nearly soluble were such as contained considerable quantities of an organic acid.—*J. Am. M. Assoc.*, 1912, v. 59, pp. 134–135.

CALCIUM PHENOLSULPHONATE, NATURE OF COMMERCIAL.—Puckner, W. A., reports that, although calcium phenolsulphonate is a distinct chemical substance and is sold by several manufacturers of chemicals, examination showed that the several brands differed considerably in composition and were unsatisfactory as to purity. —*J. Am. M. Assoc.*, 1912, v. 59, p. 1157.

CAMPHOR.—An editorial note (*Pharm. J.*, 1912, v. 35, p. 363) points out that the distillation of camphor from leaves is to be commenced on a practical scale in Formosa. Experiments have been carried on for five years, and it has been found that the best results are obtained from the use of the leaves only, branches not being cut. The export of camphor from Formosa last year showed a decrease of nearly nine hundred thousand pounds. The largest purchaser was Germany, which took four times as much as the United Kingdom.

CAMPHOR, POISONING BY.—An abstract (from *Zentralbl. f. Gynäcologie*) calls attention to a fatal case of poisoning from the use of camphorated oil in the peritoneal cavity.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 538.

CANNABIS INDICA.—Xrayser II points out that cannabis indica has fallen greatly into disuse in Great Britain, and it now matters little whether the drug is produced in Asia, Africa or America. Quite possibly this lack of interest has been brought about by our failure to ensure that our preparations are always active.—*Chem., and Drug.*, 1912, v. 81, p. 547.

CHAVOSOL is the methyl ether of chavicol, which may also be described as para-allyl-phenol, $C_6H_4C_3OH$. It is a fragrant aromatic liquid, having a powerful bactericidal action, and is being introduced as a disinfectant for dental work.—*Pharm. J.*, 1912, v. 35, p. 298.

CINCHONA.—Horper, D., in a discussion on the introduction of cinchona into Java, states that Hasskarl in 1852 introduced 500 Calisaya seedlings from South America.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 454.

COCAINE.—An editorial note (*Pharm. J.*, 1912, v. 35, p. 363) points out that the use of cocaine in India is becoming a very serious evil, the natives having acquired the cocaine habit. In order to strengthen the hands of the Excise department, the Bombay Government has introduced an amendment of the existing law designed to check the illicit importation of cocaine, and giving officers the power to secure surety bonds from the accused charged with an offence; the amendment also enables a magistrate to impose a term up to two years' imprisonment, and a fine of Rs. 4,000.

COFFEE.—An abstract presents a compilation of the per capita consumption of coffee in the several countries. This varies from 15.12 pounds in Holland, 1.33 in the United States, 5.80 in Germany, to 0.65 pounds in England. The extremely low consumption in England is thought to be due to the exceptionally large consumption of tea.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 539.

DIGITALIS.—Weiss, E. (*Oesterr. Sanitätswesen,* Beilage zu No. 22, v. 30, 1912), presents a comprehensive report on a comparative study of preparations of digitalis. He concludes that the most active and most reliable form of digitalis preparation is a freshly made infusion. The precaution should be observed to use a reliable drug, to have the infusion freshly prepared and not to use the infusion after it is 12 hours old.—*Schweiz. Wchnschr. f. Chem. u. Pharm.*, 1912, v. 50, pp. 486–488.

DIORADIN.—A report of the Council on Pharmacy and Chemistry of the American Medical Association, in reviewing the claims made in regard to the composition of this product, points out that they have been largely vague statements and contradictions which arouse a feeling of uncertainty and lack of confidence. Until this uncertainty is cleared away, dioradin is not eligible for inclusion in New and Non-Official Remedies.—*J. Am. M. Assoc.*, 1912, v. 59, pp. 1556–1558.

HEXAL.—This is the name applied to hexalmethylenetetramine sulpho-salicylate which occurs as white crystals that are readily soluble in water but more difficultly soluble in alcohol or ether; on heating to about 45° a distinct odor of formaldehyde is produced. Hexal is recommended as a urinary antiseptic to be given in doses of 1 gram 3 to 6 times a day.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 605.

KERATIN, POOR QUALITY OF COMMERCIAL.—Puckner, W. A., reports that a sample of keratin examined by him was found to be almost completely (98.73 per cent.) soluble in hydrochloric acid-pepsin solution, and apparently no satisfactory product is being marketed at the present time.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1157.

MAGNESIUM PEROXIDE, DEGREE OF PURITY OF.—Puckner, W. A., reports that while MgO_2 is advanced as a chemical formula for magnesium peroxide, examination in the laboratory showed that the several commercial brands contain only 12.17 to 25.18 per cent. of real magnesium peroxide.—*J. Am. M. Assoc.*, 1912, v. 59, pp. 1157–1158.

MENTHA PIPERITA.—Mossler, G. (*Pharm. Post*), reports a number of experiments in the cultivation of peppermint. He found that the use of ordinary stable manure increased the yield of oil 10 per cent. Artificial fertilizers like potassium nitrate or potash had little or no influence.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 550.

MENTHOL.—An editorial (*Chem. and Drug.*, 1912, v. 81, p. 614) points out that the rapidly increasing use of menthol in Europe and the United States is leaving but a narrow margin between consumption and production. In the United States, for instance, the imports of menthol have increased from 20,183 pounds in 1908 to 50,533 pounds in 1911. The reputed value of the amount imported has increased from $33,240 in 1908 to $122,977 in 1911.

MERJODIN.—Merjodin is the name applied to the diiodparaphenol-sulphonate of mercury. It has been recommended as a reliable anti-syphilitic in secondary and tertiary lesions.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 605.

PYRAMIDON.—An editorial (*J. Am. M. Assoc.*, 1912, v. 59, pp. 461–462) calls attention to the advertisements in newspapers of a new "headache cure," the advertising slogan of which is that it "contains no acetanilid or phenacetin." The name of the preparation is *midol*, and on examination it was found to depend essentially on pyramidon for its therapeutic effects. A second preparation of the patent medicine type in which pyramidon is the essential drug, is *nurito*. A quantitative examination indicates that the composition of nurito is essentially as follows: milk sugar, 34 per cent.; phenolphthalein, 6 per cent.; and pyramidon, 60 per cent.

QUININE, USE OF.—An unsigned note (*Chem. and Drug.*, 1912, v. 81, p. 498) points out that while quinine has long been a staple product of importation into the United States, no marked growth in its imports has occurred in the last quarter of a century. In 1882, for example, over 5 million lb. of cinchona bark was imported; in 1892, 3½ million lb.; in 1902, 3¾ million lb.; and in 1912 the imports will probably be about 3½ million lb. In 1882 the imports of quinine and the various salts of quinine amounted to 795,000 oz.; in 1884, 1½ million oz.; in 1892, 2⅚ million oz.; in 1902, 2⅚ million oz.; while the rate of importation in the nine months of the current fiscal year for which figures are at hand point to a total of about 3 million oz. in the twelve months ending with June.

QUININE TANNATE, QUALITY OF COMMERCIAL.—Puckner, W. A., reports that while quinine tannate is official in most foreign pharmacopœias, and is required to contain not less than 30 per cent. of anhydrous quinine alkaloid, examination of the commercial products available in this country showed them to be of only fairly good quality. One sample contained about 9 per cent. of uncombined alkaloid and, consequently, was bitter and unfit for use.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1158.

SANTONIN.—An editorial note (*Pharm J.*, 1912, v. 35, p. 313) calls attention to the steady advance in the price of santonin, which, at the present quotation, is more than double the price of silver, and about twenty-five times the price at which the glucoside could at one time be bought. It is also curious to note that so far from the high price checking the consumption of santonin, the demand has actually increased with the advancing prices.

TANNAPHTHOL.—Tannaphthol is the name applied to a condensation product of tannin albuminate and benzonaphthol. It is being used as an astringent in diarrhœa in doses of 0.5 to 1 Gm. Also used as an antiseptic powder.—*Südd. Apoth.-Ztg.*, 1912, v. 52, p. 605.

TRAGACANTH.—Fromme, G. (Cæsar & Loretz, *Jahres-Ber.*, 1912, pp. 89–91), found the borax test referred to by Fuller (*Am. J. Pharm.*, 1912, v. 84, pp. 155–158) to be misleading. Samples of tragacanth that were known to contain Indian gum did not respond to the test, while samples of genuine tragacanth were found to yield a jelly that even when treated with solution of borax for the required time did not become sufficiently liquid to pour.

VERONAL.—A reply to a query states that like other hypnotics, veronal may lead to the formation of a habit, but there is as yet practically no literature on the subject.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1392.

In an inquest on the body of a woman, who died as the result of taking an overdose of veronal, the jury in returning a verdict of "Death from misadventure," added a rider to the effect that the indiscriminate sale of veronal should be checked.—*Pharm. J.*, 1912, v. 35, p. 328.

ZINC PERMANGANATE, NATURE OF.—Puckner, W. A., reports that zinc permanganate as found on the market was found to vary considerably. While the best specimens contained as high as 97 per cent. of the theoretical amount, others contained but about 73 per cent.—*J. Am. M. Assoc.*, 1912, v. 59, p. 1158.

NOTES ON ELIXIR FERRI, QUININÆ ET STRYCHNINÆ PHOSPHATUM U. S. P. AND AN IMPROVED FORMULA.

By W. L. Cliffe, Philadelphia.

The present U. S. P. formula for the elixir of iron, quinine and strychnine phosphates, appears to be unnecessarily complicated in technique and quite liable to yield unsatisfactory results in the hands of other than skilful pharmacists.

As the chemical necessity exists for the use of an intervening solvent it appears to the writer that the use of an alkaline phosphate that is stable in character like phosphate of soda would be more in accord with the title and formula and very much simpler in detail than the ammonium acetate in use at present.

The phosphate of quinine is also present to nearly the limit of solubility and in constructing the proposed formula it was deemed wise to take advantage of the well-known action of the organic acids, like lactic acid, which exert upon the solubility of the alkaloidal phosphates a similar influence to that upon the earthy phosphates.

The simplified formula and process based upon these premises is as follows:

Soluble ferric phosphate....................	17.500 Gm.
Sodium phosphate........................	17.500 Gm.
Quinine	8.750 Gm.
Strychnine	0.275 Gm.
Phosphoric acid, U. S. P..................	2. c.c.
Lactic acid, U. S. P......................	4. c.c.
Hot distilled water	150. c.c.
Alcohol	50. c.c.
Aromatic elixir q. s. to make.............	1000. c.c.

Dissolve the quinine and strychnine in the alcohol and add the phosphoric acid; stir until a magma is formed and then add the lactic acid, stirring until solution is effected; to this solution add 700 c.c. of aromatic elixir.

Dissolve the soluble ferric phosphate and the phosphate of soda in the hot distilled water; add this solution to that previously made and enough aromatic elixir to make 1000 c.c

The result is a bright clear yellow green elixir that possesses every desirable feature from a physical and chemical point of view and can be made in a few minutes without special manipulation. It contains the same dosage of all active ingredients as the present U. S. P. preparation.

BOOK REVIEW.

OUTLINE OF COURSES IN BOTANY, MICROSCOPY, AND PHARMACOGNOSY. Henry Kraemer. Philadelphia and London: J. B. Lippincott Company.

Although this pamphlet of 50 large 8vo pages is primarily designed to facilitate instruction in Botany and Pharmacognosy in Colleges and Schools of Pharmacy it also presents exceptional possibilities for home study on matters relating to pharmacognosy. With the rapidly increasing need for better knowledge regarding the structural characteristics of the more important drugs and with the evident probability that structural characteristics of drugs and the appearance of powdered drugs under the microscope will be described at some length in the coming edition of the Pharmacopœia of the United States there is every indication that the pharmacist who wishes to maintain his position must be thoroughly conversant with the microscope and its possible uses. For the student who is desirous of reviewing the work that he has had in the college of pharmacy and for the pharmacist who is desirous of preparing himself for the requirements of the very near future this pamphlet offers opportunities not readily found elsewhere. For the practical development of a course of home study it would be desirable to have a set of authentic type drugs and a collection of permanent microscopic slides for control. Arrangements could no doubt be made for supplying the necessary materials and with such an equipment any pharmacist should be able to prepare himself for the very much higher requirements that he will be obliged to comply with on the publication of the U. S. P. IX. M. I. W.

THE DETERIORATION OF DRUGS.

The investigations of Hale[1] on digitalis, of Edmunds and Hale[2] on ergot, and Dohme[3] on calabar bean, coca and aconite, have revealed the facts that many drug preparations deteriorate, and that drugs are often several years old when they reach the patient. These facts have been emphasized, also, through a report of the Council on Pharmacy and Chemistry, dealing with the testing of epinephrin solutions in which the Council recommends that "manufacturers stamp the age of manufacture on the container, to guard against samples which are obviously overaged." Naturally some manufacturers have asserted that the reported deterioration is accidental, or have tried to put the blame on the pharmacist. Some have shifted their previous claims as to strength in such a way as to avoid responsibility. Some firms, however, instead of attempting to dodge responsibility, are doing what ought to be done, and indicate the date of manufacture on the label of those preparations which are prone to deterioration. This, for instance, has been done by Fairchild Bros. & Foster for their Lactic Bacillary Tablets (N. N. R. Supplement, 1912, p. 5); by Hynson, Westcott & Co. in the case of their Bulgara Tablets (N. N. R., 1912, p. 127) and by the H. K. Mulford Co. for their Cornutol (N. N. R. Supplement, 1912, p. 2) and Digitol (N. N. R. Supplement, 1912, p. 3). A serious attempt to overcome deterioration has been made in a recent report by Pittenger and Vanderkleed,[4] of the scientific staff of the H. K. Mulford Co., on methods for the preservation of fluidextract of ergot. They found that a fluidextract of ergot, put up in hermetically sealed vials, kept its strength for a year without the least change.

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[1] Referred to editorially in The Journal A. M. A., April 22, 1911, p. 1198.
[2] Referred to editorially in The Journal A. M. A., March 9, 1912, p. 705.
[3] Dohme, A. R. L.: Am. Druggist, 1909, lv, 37.

While most pharmaceutical houses appear indifferent to the demands of modern medicine, there are signs, nevertheless, that scientific pharmacy is making headway.—*Jour. A. M. Assoc.*, Sept. 21, 1912, p. 959.

SCAMMONY ROOT AND SCAMMONY RESIN.

From the results of the investigations by Power and Rogerson (*Trans. Chem. Soc.*, vol. 101, 1912, pp. 389–412) it will be seen that the resins obtained from scammony root and from the gum-resin known as scammony, although similar in their general characters, are not perfectly identical. On the other hand, a comparison of the resin from scammony root with that obtained from the root of *Ipomoea orizabensis* (*Ibid.*, p. 1) shows that these two products differ very considerably in their composition. Both of these resins are exceedingly complex in character, but consist to a large extent of the glucosides and methylpentosides of jalapinolic acid, $C_{15}H_{30}(OH)CO_2H$, and its methyl ester. Whilst, however, the methylpentose obtained by the hydrolysis of the resin from scammony root appears to be identical with rhamnose, that from the resin of *Ipomoea orizabensis* yields a crystalline tetra-acetyl derivative, which had not heretofore been described. The resin from the last-mentioned source contained, among other substances, small amounts of hentriacontane, $C_{31}H_{64}$, and cetyl alcohol, $C_{16}H_{34}O$, which were not present in the resin from scammony root, and, furthermore, very marked differences were observed in extracting both the crude resins and the products of their alkaline hydrolysis with various solvents. It is not to be expected, however, that products of this nature would be uniform in composition, and the differences which have now been observed to exist between them may not be constant, or such as appreciably to influence their therapeutic value.

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[4] Pittenger, P. S., and Vanderkleed, C. E.: Jour. Amer. Pharm. Assn., 1912, i, 700.

In view of the complexity of the above-mentioned resins, it is evident that they cannot be represented by chemical formulæ, a fact which they had previously indicated in connection with the investigation of jalap resin (*J. Amer. Chem. Soc.*, 1910, 32, 112). The names by which the resins now under consideration have heretofore been designated, such as "jalapin" or "scammonin," with the assumption that they were individual substances, should, therefore, also be discarded.

THE "WELLCOME" PHOTOGRAPHIC EXPOSURE RECORD AND DIARY, 1913.—Within its closely packed pages this book contains a surprising number of useful and practical paragraphs for the field, the dark room and the studio. Among the most novel features are the descriptions of new methods of toning prints green and blue, by the use of "Tabloid" toners which act selectively, leaving the high lights only faintly colored. There are also some interesting new notes on the technique of color photography, and on modern methods in development.

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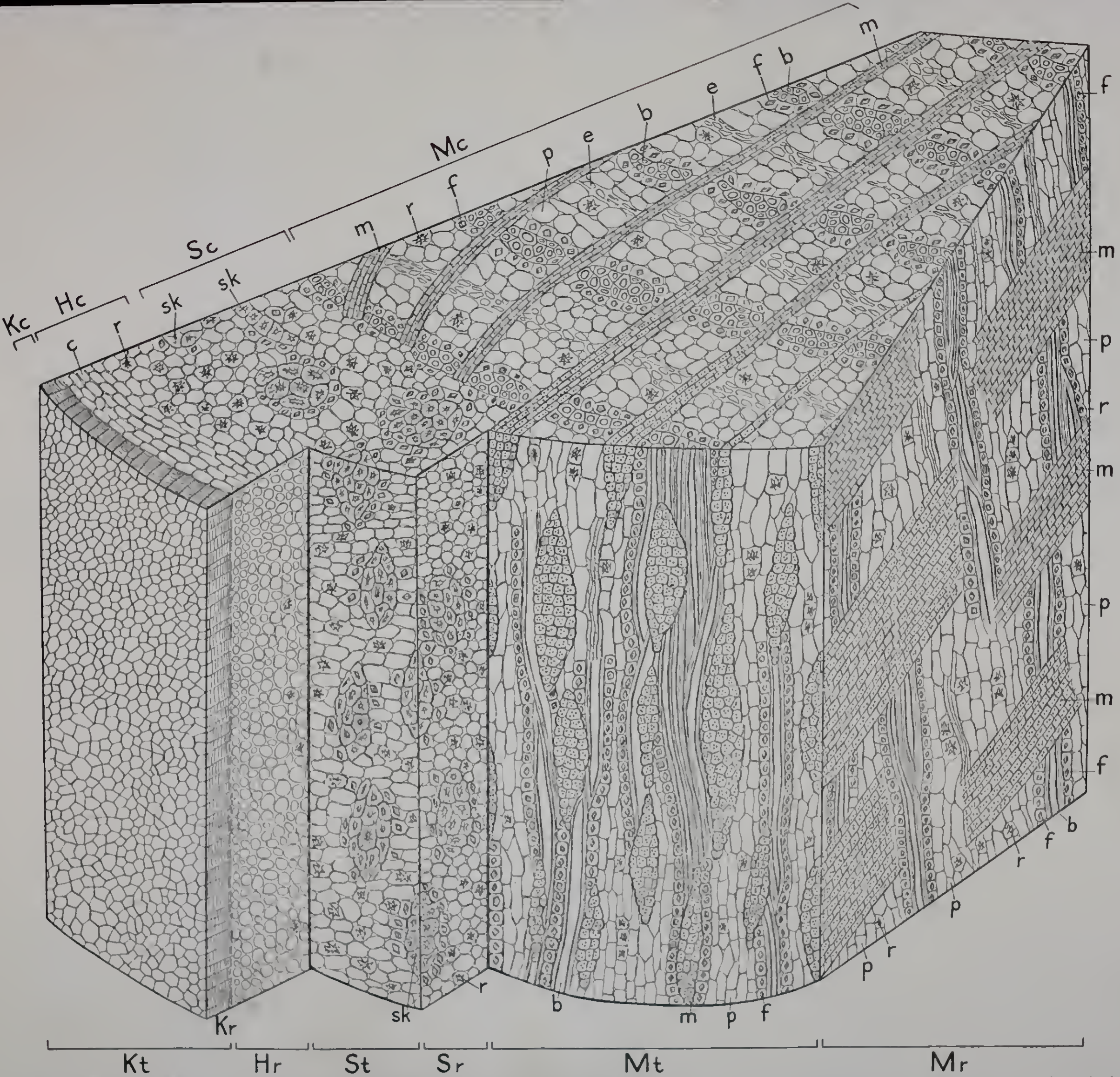

The outer bark and part of the inner bark of Rhamnus Purshianus in transverse, radial-longitudinal, and tangential-longitudinal sections. Mc transverse section of innerbark; Mt, tangential-longitudinal section of inner bark; Mr, radial-longitudinal section of inner bark; Sc, transverse section of stone cell area; St, tangential-longitudinal section of stone cell area, Sr, radial-longitudinal section of stone cell area; Hc, transverse section of outer layers of cortex, Hr, radial-longitudinal section of outer layers of cortex; Kc, Kt, Kr, transverse, tangential-longitudinal, and radial-longitudinal sections of cork b, bast fibers; f, crystal fibers; p, parenchyma; e, sieve, sk, stone cells; m, medullary ray cells; c, collenchyma.

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American Journal of Pharmacy, 84, 1912.

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